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F. G. SCHAUPP JOHN B. SMITH GEO. H. HULST
CHAS. LOUIS POLLARD R. P. DOW J. R. de la TORRE-BUENO

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, *Editor*
G. P. ENGELHARDT J. BEQUAERT

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BULLETIN
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BROOKLYN ENTOMOLOGICAL SOCIETY

VOL. XV FEBRUARY, 1920 NO. 1

MIGRATORY RESPONSES OF WATER-STRIDERS DURING SEVERE DROUGHTS.[1]

BY C. F. CURTIS RILEY, The New York State College of Forestry at Syracuse University, Syracuse, New York.

It is well known that certain species of water-striders are polymorphic with respect to wing development. There are macropterous, brachypterous, and apterous forms. Kirkaldy[2] (p. 109) has observed six different variations, in wing development, among the brachypterous individuals of the species *Gerris lacustris* Linné. These alary differences are pointed out here only because of the modifying influence that they must exercise on the migratory responses of the gerrids. Such variations in the development of wings not only must act as modifiers of the manner of migration, but they also must exert an influence with respect to the number of individuals that migrate during different seasons. Attention is directed to the fact that the number of macropterous and apterous forms vary from one season to another.

During periods of sustained and severe droughts the migration responses of both macropterous and apterous water-striders are particularly interesting and worthy of observation. It is not only of importance to obtain information concerning the modes of migration, but it is also of consequence to discover what becomes of the apterous migrating gerrids after the water in their habitats has dried up entirely. Such droughts, extending over a large region, are likely to cause the death of great numbers of apterous individuals, and even may result in the extinction, during a particular season, of any species represented by apterous specimens solely. Kirkaldy,[3] discussing some of the habitat responses of *Gerris lacustris,* makes the following statement with respect to this subject:

---

[1] For a more complete consideration of many points mentioned in this paper, attention is directed to a recent publication by me: Riley, C. F. C., "Some Habitat Responses of the Large Water-Strider, *Gerris Remigis* Say," American Naturalist, Vol. LIII (1919), pp. 394–414, 483–505; Vol. LIV (1920), pp. 68–83.

[2] Kirkaldy, G. W., "A Guide to the Study of British Waterbugs (Aquatic Rhynchota)," Entomologist, Vol. XXXII (1899), pp. 108–115.

> In small wayside pools or streamlets which dry up periodically, it is obvious that the apterous inhabitants will die out unless their habitat is sufficiently near to a large stream or pond; a severe drought occurring over a fairly large area, prolonged sufficiently to dry up all the water within that area, would cause all the species represented in that year by apterous individuals only to become extinct.

In my outdoor observations on water-strider responses and water-strider habitats, I have attempted to obtain some information on the points to which I have directed attention, in connection with two different species, *Gerris marginatus* Say and *Gerris remigis* Say. These observations have been recorded, mainly, in the states of Illinois, Wisconsin, and New York. This work was done in connection with the study of water-strider habitats of varying and dynamic character, for example, rivers, creeks, brooks, both permanent and intermittent, lakes, and ponds. While all of these different kinds of habitats have contributed something to the general subject, the best data have been obtained from the study of intermittent brook habitats.

On the surface of intermittent brooks, which frequently have a rapid current, the two species of water-striders, *Gerris remigis* and *Gerris marginatus,* are fairly common. The former species is found in greater abundance, as brooks of this character are more nearly like its normal habitat. While individuals of the latter species are few in number, as compared with those of *Gerris remigis,* yet a considerable population may be found in protected places where the force of the current is reduced, such as sheltered bays, formed by tree roots and irregularities in the banks of the brooks, and in quiet backwaters.

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[3] Loc. cit., pp. 109–110.

During periods of drought in summer, it is a very common occurrence to find certain of the physical conditions of intermittent brooks decidedly modified from what they are in periods of normal rainfall. The most evident modification is that due to the loss in volume of water. If a drought period should be prolonged, such brooks may be so changed as to form merely a series of isolated pools, along their otherwise dry channels. In the earlier drought stages, these pools are connected by means of riffles of water, which become more and more contracted as the drought develops.

While droughts are in their earlier stages, and the brook pools are still connected by means of narrow riffles of water, I frequently have observed that the apterous individuals of both species of gerrids travel from one pool to another by means of these small riffles. Eventually, if the drought continues until the riffles disappear, these water-striders are found on the surface of the isolated pools that are distributed along the beds of the brooks. Specimens of *Gerris remigis* frequently are present in such situations in large numbers, while individuals of *Gerris marginatus* are comparatively few. That some of the alate specimens of both species, also, stride along the surface of these riffles from one pool to another is a well-authenticated fact, as I often have observed such responses. Of course it is quite possible that some of them make the journey by flight, but I have not seen such flights. Certainly the alate gerrids are found intermingled with the apterous individuals that are congregated on the surface-film of the isolated pools of water, after the riffles have become dry.

As the volume of water continues to decrease, in intermittent brooks, owing to the prolongation of the drought period, it is evident that the alate gerrids, *Gerris marginatus,* become reduced in numbers, from day to day. This probably is due to their migration by flight. But when the brooks have reached the isolated pool stage, it is found that some members of this species of water-strider are still present, for they are congregated on the surface of these pools. Not only is this true with respect to the apterous forms, but it is true, also, with respect to the alate individuals, as I previously have indicated. At this stage in the process of the drying up of these brooks, gerrids belonging to the species *Gerris remigis* are observed to be crowded into such isolated pools also, but in far greater numbers than the former species.

As is well known, *Gerris remigis* includes both alate and apterous forms, and it is possible that some of the macropterous individuals migrate by flight just previous to, and immediately after the isolated pool stage is reached. I have no absolutely authentic evidence that this occurs, but it is possible, for I have thought, during certain seasons, that there seemed to be some decrease in their numbers at such times, although, according to my observations, the alate forms are very few at any time. During those seasons, when I have found a sufficient number of alate individuals of *Gerris remigis* to make the effort at all worth while, I have tried to obtain more data on this matter by attempting both to count them and to estimate them, from day to day, on the surface of various pools, from a number of different brooks. I regret to state that the results were not very satisfactory. It is a difficult proceeding, as anyone attempting to undertake it will very quickly discover, because it is necessary to count all the water-striders, both alate and apterous forms, in order to obtain any exact quantitative information. While I did not achieve definite results, it did seem, during some seasons, that there was a slight reduction in the number of alate individuals at the drought stages that I have mentioned. I wish to point out that alate forms of *Gerris remigis* are found in the most unexpected situations, frequently far from any permanent stream. It seems difficult to explain their presence in such places, unless they have migrated there by flight.

When droughts are protracted, the isolated pools along the channels of intermittent brooks become smaller and smaller. Sometimes, during high temperatures and rapid evaporation of the water, some of the alate individuals of *Gerris marginatus* migrate, probably, by flight, as the water surface is reduced rapidly in area. Certainly, they are fewer in numbers than is the case at the beginning of such droughts, On perhaps three occasions, when droughts of this character extended into the fall, I have witnessed the flight of a few isolated specimens. I wish to state that it was several years, after I first became interested in the family Gerridæ, before I saw a water-strider fly without some artificial stimulation. Flight occurs at dusk and during moonlight nights. This fact I observed for the first time in Illinois. Flight may take place at other times also, but it has not been seen by me.

At this point it may be worth while to direct attention to some of the statements, regarding flight responses of water-striders, by certain other observers. Kirkaldy,[4] referring to the Gerridæ in general, states that the wings are used for no other purpose except flight. This observer,[5] discussing the flight of water bugs, records the fact that night is their usual time for migration. From the general context it is inferred also that water-striders migrate at night. Although he does not say so specifically the idea is presented that such migrations may occur during moonlight nights. This writer[6] directs attention to the fact that electric light, and other strong light, acts as a stimulation to migration, thus suggesting that such responses do not take place during absolute darkness, but rather when there is a certain modicum of light. This is in agreement with the fact that the water-striders, *Gerris orba* Stål (Essenberg,[7] p. 400), *Gerris remigis,* and *Gerris marginatus* (Riley, MS.) are positively phototactic. According to information from Kirkaldy,[8] apparently, *Gerris thoracicus* Schumm., in Hungary, and *Gerris tristan* Kirk., in Ceylon, both may migrate at night. Referring to the Gerridæ in general, he[9] (p. 151) makes the following statement, which seems to indicate that this writer considers some of them to migrate by flight:

> As has been previously remarked, many of the Gerridæ conceal themselves—in fact "hybernate"—under moss, stones, etc., often far from water, during the winter.

---

[4] Loc. cit., p. 109, footnote.

[5] Ibid., p. 110.

[6] Ibid.

[7] Essenberg, C., "The Habits of the Water-Strider, *Gerris Remigis* [Orba]," Journal Animal Behavior, Vol. V (1915), pp. 397–402.

[8] Loc. cit., p. 110.

[9] Ibid., pp. 151–154.

De la Torre Bueno[10] (p. 110), while not making a categorical assertion, intimates that *Gerris rufoscutellatus* Latreille may migrate by flight. According to Essenberg,[11] *Gerris orba* may be stimulated to flight during its phototactic responses. Below is given a quotation from this observer:

> *Gerris remigis* [*orba*] is positively phototactic. If it takes to its wings once in a while it always flies toward the light, producing a buzzing sound as it flies.

It is to be inferred, from a statement by de la Torre Bueno[12] (p. 203), that the alate forms of *Gerris remigis,* probably, are able to migrate by flight. The quotation from him follows:

> These winged adults are generally found solitary in the most unlikely places—isolated little pools, springs, rock-holes, beach drift, far from the favorite haunts of this stream-loving bug.

During a discussion of the locomotor responses of *Gerris remigis,* he[13] states that:

> The wings, when present, are serviceable, the European forms being recorded as using them in flight, not observed with our species.

This writer,[14] in the paper to which I have referred, remarks, apparently with reference to the genus *Gerris* in general, that:

> Some species are recorded to fly by night, but ours have not been observed doing so.

De la Torre Bueno[15] (pp. 295–296), writing of *Gerris marginatus,* states that:

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[10] de la Torre Bueno, J. R., "Remarks on the Distribution of Heteroptera," Canadian Entomologist, Vol. XLV (1913), pp. 107–111.

[11] Loc. cit., p. 400.

[12] de la Torre Bueno, J. R., "Life-history and Habits of the Larger Waterstrider, *Gerris remigis* Say (Hem.)," Entomological News, Vol. XXVIII (1917), pp. 201–208.

[13] Ibid., p. 204.

[14] Ibid., p. 205.

[15] Ibid., "Life History and Habits of the Margined Water Strider, *Gerris marginatus* Say (Hem., Het.)," pp. 295–301.

> The species is a strong flier, and I have found it in ocean beach drift in July, on the shores of Long Island.

The following quotation, from him,[16] gives a little more information with reference to the flight of water-striders, particularly those that live on the surface of stagnant waters:

> The species inhabiting land-locked bodies of water must, however, always have some means of travelling if the water on which they live dries up, as so frequently happens with small ponds or water-holes. Hence wings still normally persist in these forms.

During such droughts as have been mentioned, I have observed in the prairie regions of Illinois, after intermittent brooks have reached the isolated pool stage, that, not infrequently, evaporation proceeds rapidly, and these pools become very contracted. When they become so small that they are not more than one or two feet in diameter and only two or three inches deep, I have found that usually the number of alate specimens of *Gerris marginatus* are very few, and on some of these small pools, there are no individuals of this species present. This fact seems to indicate that many of them have migrated, probably, by flight. On the surface of these very small pools of water, *Gerris remigis* is present in large numbers, but, strange to relate, this species evinces no responses which seem to indicate an attempt to escape from such unfavorable surroundings. This is a phenomenon to which I[17] have directed attention in another of my papers.

Eventually, many of these small isolated pools become completely dry. As Kirkaldy[18] has suggested, large numbers of apterous gerrids must perish, and in those instances where a species is represented, in a particular locality, by apterous individuals only, it may become extinct, in so far as that particular region is concerned. The latter contingency would be the result should the drought be protracted, severe, and extended throughout a large area. During such periods of drought, I am convinced that large numbers of apterous water-striders do die. I have observed that the gerrids are, apparently, far more numerous at the beginning of a severe drought, extending over a considerable area, than they are when the brooks again contain their normal volume of water, after such a drought has run its course.

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[16] Ibid., p. 297.

[17] Loc. cit., p. 400.

[18] Loc. cit., p. 109.

From this point to the close of the paper, the discussion treats, mainly, of the responses of apterous gerrids of the species *Gerris remigis*. Attention already has been directed to the fact that during the later stages of severe droughts, which extend over a long period of time, the isolated brook pools decrease rapidly in size, until, eventually, they become dry. At this point in the drought stage, just prior to the total evaporation of all water in these small pools, it might be expected that the apterous water-striders, trapped on their surfaces, promptly would make their way overland to other pools of water in the immediate vicinity, but actual observation proves that this, usually, is not the case. The gerrids do not leave the pools until after all the water has dried up. The finding of another pool of water, if farther away than six or eight yards or such a matter from the original pool on which the gerrids had lived is a very precarious proceeding. In whatever direction the water-striders venture, after leaving the site of the former pool, the strong probabilities are that they will continue to move in that general direction until some external stimulation results in a response that turns them from it. The commonest form of stimulation is that of contact, which is due to the gerrids encountering certain obstacles in their pathway, such as stones, driftwood, pieces of dry mud, and clumps of dead leaves. After coming in contact with such obstacles, the water-striders turn either to the right or to the left, thus being directed along a new line of progress. Sometimes, they remain near these objects with their bodies closely applied to them. After remaining in such positions for varying lengths of time, they then move forward again. It is not always possible to tell what the stimulus is that results in the change of direction. It is quite within reason to believe that, in certain instances, such a response may be due to some internal stimulation that causes a change in the internal activities of the body, which change evinces itself in such a response as has been mentioned.

The whole process of moving away from the site of a former pool to another body of water seems to be a hit and miss proposition. The gerrids first try one direction and then they try another. The proceeding appears to be one of trial and error, the errors predominating, a process of repeated attempt and failure, on the part of the water-striders. Some of the apterous gerrids may be successful in reaching water elsewhere, but/usually/there does not seem to be any direct response to another body of water *per se*. Indeed, a casual observer would say that the entire proceeding was one of chance.

It must be recalled that in the brook channels of the character under consideration there are many obstacles, such as rocks, driftwood, clumps of dead leaves, and pieces of dried mud. Further, the surfaces of the beds of these brooks are of baked mud and they are very uneven. Partly because of obstacles of this kind, it is very improbable that the sense of sight plays much of a rôle in assisting these gerrids to find water, for it is evident that the obstacles mentioned must obstruct the view of the gerrids very materially. This is appreciated more definitely when it is recalled that the water-striders are small in size and also that their eyes are close to the surface of the ground. Frequently, it has happened that the nearest pool of water was situated around a bend in the brook, away from the water-striders, so that it was impossible for them to see it from the location of the pool on which they formerly had lived.

If it is necessary for the gerrids to travel only a distance of two, three, or four yards, or such a matter before reaching another pool of water, under such circumstances, vision may prove to be an important factor in locating it. Pools of water are good reflecting surfaces and it is very probable, at such short distances, that the reflections of the rays of sunlight materially aid the gerrids in finding them. However, for vision to become a factor of importance to the water-striders in reaching other pools, after the one on which they had been living has become dry, it is necessary that there shall be few if any obstacles in the brook channel and that the surface of the ground shall be smooth and flat. Such conditions, according to my observations, are seldom found in brooks of the character under discussion.

Drzewina[19] (pp. 1009–1010) in some experiments on *Carcinus mænas* found that moisture given off from the sea was the chief stimulus, under certain conditions, in causing these arthropods to move toward the sea and eventually to reach it. Moisture, diffusing through the atmosphere, may play some rôle in these migration responses of water-striders, but, if so, I believe that it is true only when there is a large body of water very near to the location of the pool on which they formerly had lived. It is possible that in such instances the gerrids may respond positively to the moisture diffusing from such a body of water, and by means of such responses eventually reach it. However, it must be recalled that, in the prairie regions of the Middle West, where many of these observations were recorded, during a severe and extended drought, in a treeless region, evaporation is excessive and moisture from such bodies of water, unless of extensive area, would be dissipated very quickly by the high temperature. It is very improbable that hydrotropism plays much of a rôle in the responses of these apterous water-striders, in connection with small isolated pools in intermittent brook channels, under such drought conditions as I have described.

I am strongly of the opinion that, during severe droughts, in rapid, intermittent brook habitats, in such regions as I have mentioned, after the small isolated pools on which water-striders have been living become dry, other bodies of water are found by these gerrids by a crude method of trial and error. Sometimes, water-striders may reach other pools, if these are large and close by, through responses to moisture, or through the sense of sight. But I believe that the greater part of the process of overland migration is one of repeated trial and error, until at length some of the gerrids may reach another water-strider habitat. Many of the gerrids are unsuccessful in their attempts to reach water—not that there is any voluntary attempt on the part of the gerrids to find another body of water, in the sense of awareness of the end to be achieved,—and therefor, large numbers of apterous individuals must perish during periods of severe and extended droughts.

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[19] Drzewina, A., "De l'hydrotropisme chez les Crabes," Comptes rendus hebdomadaires des séances, Société de biologie, T. LXIV (1908), pp. 1009–1011.

OBSERVATIONS MADE AROUND BAR–SUR–AUBE, FRANCE, WITH A LIST OF THE CARABIDÆ FOUND THERE.

By Alan S. Nicolay, New Brunswick, N. J.

A member of the American Expeditionary Force is not usually in a position to give much time to anything but his war duties and when I sailed for France I had reconciled my mind to the fact that entomology must be forgotten until the fracas was over. The day of the armistice (November 11, 1918) found me in Bar-sur-Aube which is some seventy miles back of Verdun and in what was called "the advanced section." This town lies on the River Aube which is a branch of the famous Marne and after the armistice was used for a time as the headquarters of the First American Army.

We hung around a few days awaiting orders and finally I was picked to go to one of the many small villages in the vicinity and billet troops returning from the trenches. I was to live with a French family and except for seeing to it that the troops were properly quartered when they remained over night my time was pretty much my own. This struck me as an excellent opportunity to get in a little collecting and part of the time I was given to stock up with supplies (one can buy absolutely nothing in the average French village), I devoted to getting a few things necessary to the handling of Coleoptera. As all my earthly possessions were carried in a blanket roll on my back, there was no possibility of taking along anything but a few small boxes. Having great respect for army courts martial, I refrained from using cyanide and substituted chloroform. Even this I had difficulty in getting as the druggists were not allowed to sell it without a doctor's certificate, but I finally persuaded him to let me have a little. More trouble still was met with when attempting to impress on him with the help of my meager knowledge of French, that I desired some flannel and small cardboard boxes. The first article being the same in the French language as the English was readily procured, but to get a few miserable boxes required wild gesticulating and repeated glances at my guide book, "The American Soldier in France," which was written for ordinary use but did not meet the needs of an entomologist. Empty cardboard boxes seemed to be an unknown article and it was with the greatest difficulty that he was persuaded to dump out some buttons and pins, after which I was charged a price worthy of the reputation the storekeepers had made for themselves with the soldiers.

On November 15, I set out for the town of Bligny which is some eight miles north of Bar-sur-Aube. This section is very beautiful and wild for France and while quite hilly it is not exactly mountainous. The brooks are clear and unpolluted although passing through many towns and the country, thickly dotted with small villages, is clean and fresh without any trace of the rubbish heaps so common in our own land. The forests are dense and consist chiefly of deciduous trees but there is a fair sprinkling of pines and evergreens. A large lumber camp close by and run by the government which supervises all the cutting of timber owing to its great scarcity, would no doubt have furnished excellent collecting during the summer. In the wooded areas, a thick, velvety carpet of moss covers the ground, while lichens grow everywhere on rocks, trees, and small bushes in great profusion. Bunches of mistletoe are very plentiful among the higher branches of trees and snails of all sizes and many species are common in damp localities.

The weather never gets so extremely cold as in our Northeastern States and their November corresponds with our October. During the fall and winter it rains literally weeks at a time converting the country into one big mud puddle. The days are quite warm (on December 12 the temperature registered 80° for a short time, but this is of course exceptional); however the nights are chilly and the very heavy frosts make the vegetation look in the morning as if it were covered with glass. There are insects flying all the year round, such as Tipulidæ, *Eristalis tenax,* certain Hemiptera and Coleoptera, etc. Coccinellidæ may be found among the pine needles, crickets can be heard on warm sunny days throughout the winter, while grasshoppers appear very much alive in the always green grasses.

The borders of a small pond just outside of Bligny furnished me with the best collecting. Back in the hills the Carabidæ and other Coleoptera were not over plentiful (during the winter anyway), but under bark and leaves in the immediate vicinity of the water "the pickings" were excellent. The French have a habit of cutting the branches of the trees for kindlings and this makes the trunks swell up and gradually assume the shape of puff-balls. Finally tiring of such harsh treatment the trees "gave up the ghost" and under their loose bark I reaped a rich harvest. Carabidæ were most plentiful but a goodly sprinkling of Staphylinidæ, Chrysomelidæ, Silphidæ, Nitidulidæ, etc., were met with. The most interesting thing about the insects was their remarkably close resemblance to our species from the North Atlantic States, over half of the genera and some species being common to both continents.

I paid special attention to the Carabidæ and with the kind help of Mr. C. W. Leng and Mr. C. Schaeffer have worked up my material in this family with the following results.

From November 15 to December 18, 125 specimens were taken representing 9 genera and 19 species. Of these one (*Badister bipustulatus*) occurs also with us, probably being imported from Europe in nursery or similar stock. Of the nine genera seven (*Nebria, Bembidion, Panagæus, Oodes, Badister, Pterostichus,* and *Platynus*) are represented in our fauna, while the remaining two (*Demetrias* and *Odacantha*) are so close to certain of our genera that the synonymy of the latter might well be questioned.

The species of Carabidæ taken are as follows:

NEBRIA Latr.

N. brevicollis Fabr. Rare under stones in wooded hills.

BEMBIDION Latr.

B. gilvipes Sturm. Common under bark around pond.
B. fumigatum Duft. One under leaves along brook.
B. biguttatum Fab. Not rare.

PANAGÆUS Latr.

P. crux major Linn. Eight specimens, all from under bark around pond.

OODES Bon.

O. helopioides Fab. One specimen.

BADISTER Clairv.

B. bipustulatus Fab. One specimen under bark around pond.

B. peltatus Panz. Two from under bark.

PTEROSTICHUS Bon.

P. strenuus Panz. Three specimens.

PLATYNUS Bon.

P. ruficorne Goeze. One under boards (U. S. mess tables).

P. obscurus Herbst. Common under bark around pond.

P. sexpunctatus Linn. One pair from under moss around pond. Closely resembles our *cupripennis* but larger and more briliant.

P. viduus Panz. One under bark.

P. viduus var. *moestus* Duft. One under bark.

P. scitulus Dej. Very common, almost every piece of bark around pond having many specimens beneath it.

P. fuliginosus Panz. With preceding and equally abundant.

P. thoreyi Dej. One specimen.

DEMETRIAS Bon.

D. imperialis Germ. Rare under bark.

ODACANTHA Pay.

O. melanura Linn. This odd species closely resembling those of our genus *Casnonia* was locally common under bark around pond.

ABOUT BOMBUS AMERICANORUM F.

By Charles Robertson, Carlinville, Illinois.

In Trans. Am. Ent. Soc., 38:405–7, Mr. Henry J. Franklin makes several statements about the synonymy of *B. pennsylvanicus* and *americanorum* which are quoted and commented on in the following order:

1. That the scutellum of the figure is yellow is an indication that *fervidus* was the species represented. This, however, is not proof, as there are specimens of both *americanorum* and *auri-*

comus before me with the scutellum completely covered with pure yellow pile.

2. I have submitted this question, with the figure and specimens and all the arguments pro and con known to me, to eight different workers in entomology. Of these eight, six agreed with me and two were undecided.

3. Until such time, however, it seems to me that we must either adopt the view given above (which is the same as the one first published by Cresson and held to by him).

4. I have decided to retain it (name *pennsylvanicus*) for this species, though it is my opinion that De Geer's figure was really made from a specimen of *auricomus* Robertson.

1. The scutel of *fervidus* is always yellow, of *auricomus* about as often as not, but in *americanorum* I have never seen a female with the scutel yellow. I would not accept a determination based on an unusual form.

2. Six out of eight agreed with the author that *americanorum* was the same as *pennsylvanicus*. Did they also agree with the opinion expressed in 4, that the figure was made from *auricomus*?

In 1903, without giving my own opinion, I asked Mr. W. J. Fox to compare *fervidus, americanorum,* and *auricomus* with De Geer's description and give me the result. In a letter of January 17, 1903, he says: "If I were identifying that which we have been calling *Bombus fervidus* from descriptions I would not hesitate for a moment in deciding it to be *B. pennsylvanicus* De Geer."

3. I deny the statement made here. Mr. Cresson identified *americanorum* and *auricomus* both as *pennsylvanicus*. Or rather he identified *auricomus* as *pennsylvanicus* and *americanorum* as synonymous. I would not accept any determination or synonymy when the author had two species mixed. For the fact that Cresson identified the males of *auricomus* as *pennsylvanicus* and referred the males of *americanorum* to *Apathus* there is no reasonable explanation except that he did have the females and workers of the two species mixed. If he had distinguished the true sexes of *auricomus* and left *americanorum* without a male, he no doubt would have identified the insects mentioned in Proc. Ent. Soc., 2:164, as *americanorum*.

That Cresson mixed *auricomus* and *americanorum* is shown by the first line of his description, *viz.,* "Females. Head black, often more or less yellow on the vertex." In 1888 females and workers of *auricomus* and workers of *americanourm* in my collection were all identified by him as *pennsylvanicus*. *B. auricomus* seems to be common at least in New Jersey. It is fairly certain that he had specimens of it and that his failure to distinguish it was because he mixed it with *americanorum*. Those who hold that Mr. Cresson did not mix the two species must maintain the absurd position that while the collection contained 80 specimens from 12 states—males of *auricomus* and females and workers of *americanorum*—it contained no examples of the females and workers of *auricomus*.

Since these bees were distinguished by me, *fervidus* has been identified by Fox and me as *pennsylvanicus, auricomus* has been identified as *pennsylvanicus* by Crawford and Pierce, but *americanorum* has not been so identified except by the anonymous persons referred to by Franklin.

De Geer's description is a good one for *fervidus,* better than the one made by Fabricius. I would not accept an identification of De Geer's species by the figure as against the description. The description seems to be perfectly accurate for the colors, while the figure gives a different impression even for the parts it shows.

The paper, published in Ent. News, March, 1890, p. 39, in which the two species identified by Mr. Cresson as *pennsylvanicus* were separated as *pennsylvanicus* (=*auricomus*) and *americanorum,* was transmitted through Mr. Cresson and its conclusions were accepted by him.

In a letter of October 20, 1888, he says, "Have you ever been able to find the female of *Apathus*? *elatus*?" November 13 he writes, "I would like to see the *Apathus*? *elatus* matter unravelled. It mystifies me considerably." September 5, 1889, he writes, "Your favor of the 27th ult, about *Bombus pennsylvanicus* and *Apathus*? *elatus* has interested me very much. I have no doubt now that we are nearing a solution of the problem and that you have about found it." November 8 he writes, "When you have completed your notes on *A.*? *elatus* and *B. americanorum* and *pennsylvanicus* please send them on and we will publish them."

THE SEVENTEEN-YEAR CICADA ON LONG ISLAND, N. Y., IN 1919.

By Wm. T. Davis, Staten Island, N. Y.

On February 24, 1919, the United States Department of Agriculture issued circular 127 devoted to brood X of the seventeen-year cicada, and brood 18 of the thirteen-year race, about to appear from Pennsylvania to Illinois and southward. From this publication we learn that brood X was reported on Long Island, N. Y., in 1902, from Kings, Nassau and Suffolk counties. Dr. E. P. Felt, New York State Entomologist in his eighteenth report, 1902, p. 113, states as follows regarding the observations made on Long Island by Mr. Chester Young: "The insects were observed by him at Wantagh, Nassau Co., also between Massapequa and Amityville, between Sayville and Oakdale, east of Patchogue to Brookhaven, and also to the north of Medford and Holtsville, and a small brood northeast of Riverhead, all in Suffolk county."

On June 9, 1919, Mr. John T. Nichols wrote that cicadas were "reported singing at Mastic last week and I heard them at one point Saturday (a few). This morning walking to the train, at one place there were many on the ground, mostly more or less eaten, some with bodies all gone. Found only two live whole ones." The two specimens were kindly sent to the writer. On June 30 Mr. Nichols wrote: "I have occasionally heard small colonies at Mastic in the past several weeks, notably one in the woodland there on June 28."

Dr. Frank Overton wrote of the cicadas under date of September 1, 1919: "I saw their effects in a small area on the South Country Road just east of Carman's River, and my boy saw them in the woods just east of Patchogue, but I have seen no other evidence of them near Patchogue. They seem to have appeared in spots."

The New York *Sun* for June 16, 1919, stated that: "From Wantage to Farmingdale and as far north as Central Park on

Long Island the pests are so thick that drivers of automobiles yesterday had to put up their wind shields to drive by the hardwood and fruit trees, where the locusts congregate."

From personal observation it can be stated that the cicadas occurred in great numbers north of Massapequa railroad station, and also to the east of that place. On July 18, 1919, Mr. Edward J. Burns and I found many pupæ skins and dead cicadas in the region mentioned. The ends of the branches of many of the oaks had broken where the cicadas had laid their eggs, giving the woods in places a brown appearance. The perennial herb, *Baptisia tinctoria,* grows commonly north of Massapequa, and it had also been extensively used by the cicadas in their egg-laying operations.

Mr. George P. Engelhardt has reported that in a visit to Baldwin, about five miles to the west of Massapequa, he found in the latter port of June but very few seventeen-year cicadas, the main body having evidently emerged to the eastward of that place.

From these facts it will be seen that *Tibicen septendecim* was observed on Long Island in 1919 at about the same places where it occurred in 1902.

In his letter already referred to Dr. Frank Overton makes this interesting statement: "Last year (1918) the seventeen-year cicadas appeared in considerable numbers in the woods along the road between Manorville and Wading River. I collected several about one mile north of the Middle Country Road. This was on a Sunday, June 16, 1918. This was the only appearance that I noticed in 1918. There did not seem to be any in that locality in 1919." Seventeen-year cicadas of 1918 can be referred to brood number IX, which is mostly confined to parts of Virginia, West Virginia and North Carolina. The cicadas occurred in great numbers at White Sulphur Springs, West Virginia, in 1918, judging from the egg-scars in the branches of trees and bushes as observed by the writer.[1]

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[1] According to reports received, they were also notably abundant about Pulaski, in Southwest Virginia.—J. R. T. B.

AN UNDESCRIBED WATER-STRIDER FROM THE ADIRONDACKS.*

By Carl J. Drake, Syracuse, N. Y.

During the summers of 1917, 1918 and 1919, the writer collected numerous specimens of a small undescribed water-strider belonging to the genus *Microvelia* Westwood upon Bean Pond, a small bog-pond on the forest tract of the New York State Ranger School near Wanaken, New York. The species dwells in small, secluded coves very near the shore usually under the shelter of overhanging vegetation or among aquatic plants. In a few instances some specimens were captured on the moist ground quite near the water's edge. The insect breeds continually during the summer, but only large nymphs and adults were taken in late fall. In Bueno's key to "The Veliidæ of the Atlantic States"[1] the species runs to *Microvelia borealis* Bueno, from which it may be readily separated by the nearly straight posterior tibiæ in the male and the nearly straight posterior margin of first male genital segment; most of the cells of the hemelytra are white or mostly white in both sexes. In the apterous form only two segments are visible from above, the prothorax being very broad. During August, 1917, I collected an apterous male and female on a small pond in Elka Park, Catskill Mountains, New York, in company with several specimens of *M. borealis* Bueno and a few specimens of *M. americana* Uhler. On a stagnant pond in Syracuse I collected a macropterous male and female during September, 1918. At the same time I took several examples of *M. borealis* Bueno, *M. americana,* and one winged form of *Merragata foveata* Drake, also specimens of *Gerris buenoi* Kirkaldy, *G. rufoscutellatus* Latr., *Trepobates pictus* H. S. and *Rheumatobates rileyi* Bergroth. I have named the insect in honor of Mr. J. R. de la Torre Bueno, who has taken an especially active interest in the aquatic Hemiptera.

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* Contribution from Department of Entomology, New York State College of Forestry, Syracuse, N. Y.

[1] Bull. Brook. Ent. Soc., Vol. XI, No. 3, p. 57.

Microvelia buenoi new species.

Winged male: Head with a longitudinal median impressed line. Antennæ sender, a little longer than head and thorax conjoined; first segment stoutest, its length subequal to that of the third; second segment shortest, the third thinnest; fourth segment longest, nearly fusiform, about equal to the second in thickness, its length slightly more than that first and second taken together. Pronotum a little wider than long, with a distinct collum, the posterior margin rounded, the humeral angles prominent, and tumid, with a broad transverse flavous line near the anterior margin. Eyes round, black, the diameter of each almost half the distance between them. Head and pronotum velvety black, a few silvery hairs near the anterior margin of pronotum, the silvery hairs forming a rather broad streak about each eye. Body beneath black, the grayish hairs giving a grayish black appearance. Elytra as broad as abdomen, membranous, the nervures black and prominent, the cells mostly white. General shape fusiform. Genital segments prominent, the posterior margin of the first above nearly truncate. Legs pilose, black, except coxæ, trochanters and basal portions of femora flavous. Bucculæ flavous. Posterior tibiæ practically straight. Length, 1.9 mm.; width, .81 mm.

Winged female: A little larger and more robust than male; hemelytra practically covering abdomen, the posterior tibiæ as in male. Pronotum and elytra marked as in male. Length, 2 mm.; width, .81 mm.

Apterous male: Fusiform, the antennæ reaching slightly beyond the posterior margin of the thorax. Thorax above divided by distinct sutures into two segments, the prothorax about three times as broad as the mesothorax; posterior margin of both pro- and mesothorax slightly rounded. Prothorax with a transverse row of pits along posterior margin of flavous line. Connexivum rather broad, outer margins slightly rounded. Abdominal segments unequal, the distal one broadest; a silvery spot, formed by silvery hairs, on each side of the first two and last two abdominal segments. Length, 1.74 mm.; width, .6 mm.

Apterous female: Not quite so broadly orbiculate as *M. borealis* Bueno, the prothorax nearly three times as broad as the mesothorax. A silvery spot on each side of the first three and last three adbominal segments and a row on each side on connexivum (a spot on each segments). Length, 1.81 mm., width, .65 mm.

Type, winged male and allotype, winged female, in my collection. *Morphotypes,* apterous male and female, in my collection.

Paratypes in the collection of New York State College of Forestry, J. R. de la Torre Bueno, and my collection.

Types from Bean Pond, Wanahena, N. Y.

NEW EXOTIC PAPILIOS.

By George A. Ehrmann, Pittsburgh, Pa.

Ornithoptera ritsemæ Snell.

Var. **tantalus** Ehrm., ♂, Ent. News, Vol. XV, 214.

♀. Antennæ, head, collar and thorax black. Abdomen, upper side pale brown; sides shaded with yellow, with a series of black spots; underneath the body is yellow. Forewings smoky brown on upper side with a double whitish spot on the outer end of discal cell; apical space with lemon-colored rays along the veins and a series of five triangular, yellowish spots along the sumarginal space. Basal area on the upper side of hindwings white, shaded with yellow outwardly; subdiscal oval black spots very large. Fringes on both fore- and hindwings white; under side of wings the same as above but paler. Exp. 6½ inches.

Habitat, Kala Bala Hills, North Borneo.

Type, Ehrmann Collection.

Papilio nepenthes n. sp.

♂. Antennæ black. Head and fore part of thorax rich carmine, the rest of thorax and upper side of abdomen velvety black; under side of thorax and abdomen carmine, upper side of forewings black with grayish striæ between the nervures. Hindwings brownish black with a large square-shaped white spot on the subapical space; below this large spot a small white spot and in cells R. 2. and R. 3. an oval-shaped carmine spot, shaded or dusted with blackish scales; in cell M. 1. a brilliant carmine spot and another elongated carmine spot on the anal angle. Scent organs pale brown. Outer parts of the tails carmine. Under side of wings same as above, but paler and an extra carmine bar on the discal area of hindwings. Exp. 5⅕ inches.

Habitat, South East Assam. Type, Ehrmann Collection.

Papilio mantitheus n. sp.

♂. Antennæ, head, thorax and abdomen black; underside of abdomen brown. Ground color of upper side of fore- and hindwings black; a large metallic green band across the disk of both wings is broken or interrupted at the outer end of discal cell, leaving four triangular greenish spots on the costa; the band continues to the abdominal margin. On the apex of forewings are two small, greenish spots and on the margin of hindwings a row of ten small, green spots. Ground color on the under side of wings pale, dirty black with a series of twelve silvery spots on the outer margin of secondaries and an additional spot of the same hue on the anal angle and abdominal margin. Exp. 4½ inches.

Habitat, Uganda, Br. East Africa.

Type, Ehrmann Collection.

Note: This species is allied to the Nireus group of Papilios, but as I have all the authenticated species of this group, viz.: *Papilio lyæus* Doubb., *P. donaldsoni* Sharpe, *P. erimus* Gray, *P. pseudonireus* Feld., etc., etc., I do not hesitate in naming this new form. The forewings are more falcated and the hindwings not dentated as in the above-mentioned species. The lower part of the hindwings is more developed than in any of the others of the *P. nireus* group.

NOTES ON SOME SPECIES OF THE HOMOPTEROUS GENUS GYPONA (HEMIPTERA).

By J. R. Malloch, Urbana, Ill.

In Mr. Van Duzee's Catalogue of the Hemiptera Woodworth's species of *Gypona* are with two exceptions sunk as synonyms of previously described species. In a recent paper on the genus by E. H. Gibson[1] but one species, *bipunctulata,* is accepted as valid.

Having access to material identified by Woodworth in the collection of the Illinois Natural History Survey which appears to throw some light on the identity of his species I present some notes which clear up a few of the doubtful points in connection therewith.

It is not at all clear to me why *albimarginata* Woodworth has been accepted as a synonym of *pectoralis* Spångberg as the description obviously can refer to no other than *limbatipennis* Spångberg. This species was originally described from Illinois. Anyone who has both species available can readily settle the matter for himself by comparing the specimens with Woodworth's description.

---

[1] Proc. U. S. Nat. Mus., Vol. 56, pp. 87–100, 1919.

Gibson accepts *bipunctulata* Woodworth as a valid species, but the type is merely a female of that author's *nigra*. As Gibson sinks the latter as a synonym of *melanota* Spångberg it appears to me that the only course left will be to follow with the female. That *nigra* is a synonym of *melanota* I do not doubt, but the female appears to me to be *bimaculata* Spångberg so that there are some other synonyms involved. The only difference between the male of *nigra* and a male of *melanota* which appears to me to warrant their being considered as entitled to separation even as varieties is that the elytra of the former are whitish while those of the latter are fuscous. The genitalia are identical in the two forms. The only specimen of *melanota* before me was named by Dr. E. D. Ball.

Four of the males of *nigra* bear manuscript labels with the word "type" on them, but one specimen so labelled was taken three years after Woodworth's paper was printed, and as all bear the label "det Woodworth '98" it is obvious that the label in at least one case is wrong.

It may be pertinent to draw attention to the fact that in all but one reference Gibson gives 1896 as the date of Woodworth's paper while it really appeared in 1887.

I have access to a limited amount of material here, but surmise that it may develop *bimaculata* Spångberg is merely the female of *melanota* Spångberg.

Before me there are a number of specimens named *bimaculata* Woodworth. No specimen of this species bear type labels. The two that are referred to in our species catalogue under the name *bimaculata* are females of *puncticollis* Spångberg, but they do not agree with Woodworth's description. The only specimens named *bimaculata* by Woodworth which agree with his description are two which I consider referable to *citrina* Spångberg. We have a series of specimens of this species from Texas and they differ in no respect from those from Illinois.

THE GROWTH OF INSECT EGGS AFTER OVIPOSITION.

By J. R. de la Torre-Bueno, White Plains, N. Y.

Mr. Charles Macnamara, in his recent article "Remarks on Collembola,"[1] comments on the oviposition of these primitive insects, remarking on the comparatively large size of the eggs as compared with the mother. Then he goes on to say "we shall not know whether . . . more than one female contributes to the egg cluster, or whether we must accept the *decidedly improbable* suggestion that the eggs increase in size after laying."[2] (Italics inserted.)

The fact is that the growth of insects' eggs after depositing is not an entirely unknown phenomenon. The post-ovarian growth of the eggs of certain ants (Packard) and parasitic Hymenoptera (Henneguy) is too well known to merit more than an allusion. In **Canadian Entomologist**[3] is the statement that the ova of *Belostoma flumineum* grow after depositing while maturing, and also change in form.

A priori there would seem to be no reason why growth, one element in the development of the insect egg, should not continue outside the ovary. If the chorion be soft and elastic, growth would not be inhibited, and in the primitive insects, such as the Collembola, phenomena such as this might be expected, just as extra-uterine embryological development occurs in the marsupials among mammals, and in the extremely primitive Echidna; and just as snake's eggs grow after depositing.

In fact, Collembola on emerging are perfect though small replicas of the parent; but in the more highly developed and specialized insects, we find a greater degree of extra-ovarian development and consequently greater immaturity of the ovum and of the larval form, which differs most markedly from the adult. On the other hand we have forms in which nearly the whole embryonic cycle take place within the body of the mother, or wholly so as in the parthenogenetic aphids.

We can draw no hard and fast line between the most immature oviparity and the most advanced viviparity in insects, of which the growth of the egg after depositing is only one to be expected phase.

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[1] Can. Ent., LI: 73–80, 1919.

[2] Op. cit., p. 79.

[3] XXXVIII: 193.

EDITORIAL.

THE ENTOMOLOGICAL JOURNAL AND THE ENTOMOLOGICAL STUDENT.

One of the uses to which entomological journals may be most profitably put is that of introducing students in entomological courses to the present day progress of the science.

This might well be promoted by those in charge of these courses, who could recommend that each student subscribe to at least one of our standard journals.

Modesty as well as wisdom forbid us to single out any one of these publications, but it is possible for a selection to be made so that all may be covered and so that the student may gain a first-hand and personal and proprietary interest in the periodical literature of the subject. With discreet choice among those of smaller cost, a student specializing could gain the nucleus of a working file of current publications.

ON FOREIGN LANGUAGES IN ENTOMOLOGY.

While going over a very extensive bibliography in one of our really important American contributions to entomological science, I ran across this title, here quoted exactly as printed:

> "Insectes recueillis en Afrique et en Amerique dans les royaumes d'Oware a Saint Domingue et dans les etats unis pendant les annes 1781–1797."

Every serious worker will at once recognize the title of Palisot de Beauvois' work. It is my text.

It is to be presumed that the author of the work first referred to sent this entry correctly capitalized, accented and punctuated to the publisher. The printer, following the American practice omitted capitals except for what *he* thought were proper names; he also did not have or deliberately omitted every accent; and finally, all superfluous commas were removed. Translated back, this rendering of Palisot's title reads:

> "Insects collected in Africa and in America in the kingdoms of Oware in Saint Domingo and in the united states during the years 1781–1797."

Whereas what it *really* says is:

> "Insects collected in Africa and in America, in the Kingdoms of Oware and of Benin, at Saint Domingo and in the United States."

All a slight difference of punctuation and capitalization.

This is by way of introduction to the remark that authors *must* have the original foreign text before them and follow it slavishly; or else they must have a working knowledge of the principal European tongues. If they have not this accomplishment, or rather, necessary equipment, then, in justice to themselves and to their readers and disciples, they ought to pocket pride and appeal to some one more familiar than they with the foreign language in question. They should also insist on printers following copy, out of the window if necessary; and in reading and checking all proof and insisting upon the corrections called for.

One of the faults of our much vaunted systems of education lies in their apparent neglect of anything outside our borders or of a non-utilitarian nature. But entomologists, being men of independent cast of mind, should rise to the occasion and have the courage to study and be right.

No entomologist who contemplates serious work is completely equipped without a working knowledge of Latin, French, and German, exact so far as it goes.

Such lapses and solecisms as that referred to should *never* be permitted to appear by author, publishe~~d~~, or printer, in a work /r whose importance renders it a standard reference for many future years.

BOOKS.

Physical Basis of Heredity, by T. H. Morgan; pp. 1–305, figs. 1–117. (J. B. Lippincott Co., $2.50.)

Here we have the third to appear of the series of *Monographs on Experimental Biology*. Its author's name denotes its authoritativeness in the field it covers. While we cannot critically discuss its merits from a genetic standpoint, we do, however, bring it favorably to the notice of entomologists.

This is, presumably, a college text on genetics. It therefore presents the subject matter in a condensed form, so that all who read may obtain an inclusive view of a large topic. Hence, every entomologist who wishes to get a broad insight into his own subject on the biological side should read this work to inform himself as to the present status of the problem of transformism.

It has, also, a more restricted interest to us students of insects, for many of the forms experimented with are insects of one kind or another, as, for instance, *Drosophila, Protenor, Abraxas, Phylloxera,* and other forms. Here we see in these not alone the carrying of characters from one generation to another and its method, but also the origin of races and of incipient species by mutations within the limits of one species or by crossings of nearly related forms within genera.

It is quite true some may deem that conditions under which these breedings are carried out depart from the normal to such a degree that their evidence does not carry the weight it might. This appears to be a tenable difficulty, but nevertheless, we cannot affirm that given conditions within variable limits are not normal; nor can we in any way except by direct, empirical experimentation determine what these conditions are, nor what combination of them fixes the optimum. And further, the adaptability of the organism to its environment and conditions of life is not always evident. We must at least regard these experiments as valuable in demonstrating plasticity, even though we cannot fix the norm, and the possibility of the appearance of new forms arising from variable conditions of food, heat, moisture, confinement, interbreeding, and the many other fluctuating elements of the problem.

Owing to increased cost, the Publication Committee has decided to make a charge for authors' separates in excess of the gratis 25. This will be 5c. each for papers of one to four pages, 6c for 5 to 8 pp., 7c. for 9 to 12 pp., proportionately for longer. Special covers will be $1.50 for the first fifty. Half tone plates 2c. additional.

PROCEEDINGS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Meeting of October 16, 1919.—*Long Island Records:* Mr. Wm. T. Davis reported that the southern cotton worm, *Aletia argillacea* Hübner, was quite common this fall on Staten Island. Mr. G. P. Engelhardt also had seen it in great abundance at Bergen Beach and in Brooklyn. Mr. Jacob Doll spoke of the aquatic caterpillars of the genus *Bellura;* one of whose species is found commonly on cat-tail in salt marshes near New York; while another lives on arrow-weed.

Scientific Programme: Collecting experiences of the members during the summer of 1919. Mr. W. T. Davis reported on the seventeen-year locust on Long Island in 1919, published in this number. Mr. Notman spoke of collections for the New York State List of Coleoptera. Mr. Pasch related his collecting experiences in the Ramapo Mountains, noting the abundance of *Argynnis.*—Mr. Shoemaker said that he had devoted some time along the Potomac River, near Washington, D. C., in search of *Cychrus ridingsii* Bland., of which very few specimens were trapped; he also mentioned the occurence there during September of *Sannina uroceriformis* Walker.

Mr. Engelhardt exhibited a series of upward of one hundred specimens of *Hepialus gracilis* collected during July and August at Dublin Shore, a small fishing village near the mouth of the La Havre River on the Atlantic Coast of Nova Scotia. Spruce wood bordering on sphagnum bogs, a combination quite characteristic of the region, proved to be the favorite habitat of this insect. On every favorable evening during a month's stay hundreds of the little ghost moths could be seen flying about in search for mates. The flight begins suddenly, soon after sunset and terminates just as suddenly in less than thirty minutes before darkness sets in. The males in wild, erratic flight dash in and out among the trees and underbrush; the females, far less numerous, fly slowly close to the ground. After capturing a few of the males with a net is was noticed that in their mad search for the females they often would strike a cotton sheet stretched across a small clearing as a backing to an acetylene light. Here they would hover up and down sufficiently long to permit the use of a cyanide jar.

The whereabouts of females frequently was indicated by the actions of the males, when during flight they suddenly dropped into low branches or plants near the ground. Search in such places usually would be rewarded by finding a pair, copulation being almost instantaneous.

With so many specimens about, some just freshly emerged, it was disappointing and baffling that nothing could be learned concerning the foodplant and larval habits of the insect. The larvæ, most probably, are borers in roots at considerable depth below the ground, yet in spite of a most diligent search nothing could be found to corroborate this belief.

Meeting of November 13, 1919.—*Long Island Records:* Mr. Doll reported the capture of *Haploa clymene* Brown at Sayville, Long Island, on July 24, 1919; also that of *Atteva aurea* Fitch at Newtown, Long Island, the larva of this moth feeding on *Ailanthus*.

Scientific Programme: Mr. J. R. de la Torre-Bueno read two communications illustrated with specimens; "Hemiptera in Beach Washup" and "Hemiptera Collected at Ithaca, N. Y.," which will appear elsewhere in this BULLETIN.

Meeting of December 11, 1919.—*Long Island Records:* Mr. W. T. Davis exhibited *Merolonche dolli* B. & McD., taken by him at Lakehurst, N. J., thus far known only from Long Island; also *Apantesis anna* Grote, bred from a caterpillar collected on Staten Island; and *Cryptocephalus binominis* Newm., from Yaphank, Long Island.

Scientific Programme: "Faunal regions in Nova Scotia" was the subject of an address by Mr. Engelhardt, who discussed his observations and experiences on two visits to this province, one in the summer of 1912 to the northern part including Cape Breton and the other in 1919 to the Atlantic coast regions, the interior, and to the Minas Basin. He said that with no high mountain ranges and a climate subject to moderation, due to the insular position of the province, faunal zones in Nova Scotia are not sharply defined, but may be recognized as three—boreal, northern and temperate.

The boreal zone, characterized by extensive sphagnum bogs and dense woods of stunted spruce and tamarack, occupies a narrow belt closely following the rocky and often precipitous coast. With an abundance of orchids, cotton grasses, Labrador tea and in a general appearance much like bogs in Newfoundland, one is led to expect also a representation of boreal insects, such for example as butterflies of the genus *Œneis*. That these are absent can be explained more easily as due to geographical limitations, rather than the lack of a favorable habitat. *Eurymus interior* was much more common in the coastal belt, than inland; otherwise the insect fauna proved more limited, but not different from that of the northern zone. Interesting and numerous forms of Noctuidæ and Geometridæ were taken at sugar and light at night.

The northern zone comprises the hill ranges and elevations above 300 feet on the ancient plateau of the interior. There are fine stands of timber, such as spruce, balsam, white pine and hemlock. Large collections, for the greater part obtained at night, show an insect fauna identical with that of New Brunswick and Maine.

The temperate zone is represented by broad, fertile valleys with the original forests of oak, maple, beech and birch supplanted largely by orchards and fields of grain. The insect fauna compares favorably with that of the New England and Atlantic Coast states. Agriculturists are experiencing much trouble in checking injury caused by economic insects, such as the codling moth, cut worms and scales.

About 2,000 specimens of Lepidoptera and several hundreds of other orders were collected on the trip.

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The Brooklyn Entomological Society again offers for sale living pupæ of Lepidoptera as listed below. Proceeds of sales will be credited to the Society's publication fund.

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Vol. XV APRIL–JUNE, 1920 No. 2

BULLETIN

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BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

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DESCRIPTION OF NEW SPECIES OF CERAMBYCIDÆ (COLEOPTERA) FROM THE PACIFIC COAST OF NORTH AMERICA WITH NOTES CONCERNING OTHERS.

By EDWIN C. VAN DYKE, Berkeley, Cal.

This paper is the fifth of a series of short papers dealing with the Coleoptera of this country to be published by me in this journal. It will contain the descriptions of a number of hitherto undescribed species of Cerambycidæ together with a few notes and remarks concerning other and related species.

Phymatodes fasciapilosus n. sp.

Dark piceous, antennæ and base of elytra rufous, underside of thorax and most of legs rufopiceous, each elytron with two decussating white fasciæ; body generally clothed with sparse erect hair, the elytral fasciæ bearing a dense, silky, white, procumbent pile. Head moderately densely, coarsely punctured; the antennæ extending three fourths length of body, the second joint small, less than one half length of third, the third very distinctly longer than the fourth. Prothorax broader than long, as broad as base of elytra, with sides evenly arcuate from apex to just before base where suddenly constricted, and moderately coarsely, rather sparsely punctured, more finely and sparsely at middle. Elytra two and a half times as long as broad, shining and distinctly though sparsely punctured over basal third, subopaque and less distinctly punctured over middle third, and shining and almost impunctate apically; the anterior fasciæ about one third distant from base, extending obliquely outwards and forwards, broader outwardly and slightly crescentic, the posterior fasciæ less than one third distant from apex, extending obliquely outwards and backwards, of uniform width and straight. Male, length 5.5 mm. and breadth 2 mm.; female, length 7 mm. and breadth 2.5 mm.

Type male and female and one paratype in my collection, taken in the Rogue River Valley of Oregon, from the wild grape vine

This species would at first sight be taken to be *P. nitidus* Lec. because of its size, appearance and type of coloration, but it differs from that species by having the third antennal joint always distinctly longer than the fourth, whereas in *nitidus* it is of about the same length, in having the prothorax distinctly broader than long and suddenly constricted at base, markedly contrasting with that of the other which is about as long as broad and gradually narrowed to base, and by having the elytral fasciæ densely clothed with white pile and the mid portion of the elytra subopaque, the entire elytra in the other being shining and with but a hair here and there. *P. decussatus* Lec., perhaps a closer relative, is easily separated by having the posterior two thirds of the elytra densely clothed with a fine pile and by being subopaque. The food plants of the three are also distinct, *fasciapilosus* living on the wild grape, *nitidus* on sequoia, juniper and the various cupressine trees of the Pacific States, and *decussatus* on the white oaks.

Phymatodes funebrus n. sp.

Black with rufous antennæ and with two semilunar fasciæ formed of white pubescence crossing the elytra; the body in general clothed with a few scattered longer and erect hairs. Head with front flat, alutaceous, opaque with a few irregular shallow punctures; the occiput with short gray pile; the antennæ three fourths length of body, second joint longer than broad and one half length of third, the third barely shorter than fourth, the fourth to sixth gradually longer. Prothorax a bit longer than wide and narrower than base of elytra, with sides arcuate at middle and gradually constricted both anteriorly and posteriorly, the disc alutaceous, opaque, and with a rather sparse covering of short and closely appressed gray and black pile. Elytra almost three times as long as broad, with sides almost straight, the disc with a broad black transverse band at the middle, considerably narrowed at the suture and formed of short, black and closely appressed sooty black hair, margined anteriorly by a convex band of silky white pile, the basal area with a sparse gray pubescence, a second silky white pubescent band, somewhat biconvex, margining the median black band posteriorly, the apex sparsely hairy like the base, the general surface where denuded or unclothed as at the base and apex, shining and somewhat æneous. Length 9 mm., breadth 2.25 mm.

Type, captured by Mr. L. S. Slevin at Carmel, Monterey Co., Cal., August 28, 1915, and now in my collection. Paratypes in Slevin collection.

This very interesting species if absolutely denuded might possibly be taken for a very much elongated *P. aeneus* Lec., but when perfect is seen to stand well apart from any other member of the genus. The white fasciæ in this species are made up entirely of pubescence, the underlying portion of the elytra being black as elsewhere.

Phymatodes nigerrimus n. sp.

Entirely black, slightly shining, prothorax and elytra clothed with a short, dense, suberect black pile, elsewhere sparsely hairy. Head rather coarsely, closely punctate, antennæ fully three fourths length of body. Prothorax slightly broader than long, narrower than base of elytra, sides evenly rounded, coarsely, densely and evenly punctate over entire surface except narrow median space running from base to middle which is smooth. Scutellum small but distinctly punctured. Elytra twice as long as broad, sides quite parallel, rounded at apex, disc rather finely, not closely but evenly punctate and subscabrous. Beneath rather coarsely, closely punctate in front, finely and sparsely over abdomen, more shining than above, the legs with femora less distinctly clubbed than usual. Length 8 mm., breadth 3 mm.

Type, in my collection, collected by myself at Carrville, Trinity County, Cal., June 16, 1913, three other specimens in Hopping collection.

This intensely black species cannot be confused with any of the other species of the genus. At first, I thought that it might possibly be a non-fasciate unicolorous black phase of *vulneratus*, seeing that it was captured with a number of these. It is, however, easily separated from this species by its type of vestiture, especially lacking the longer vestiture of the prothorax, by having a denser and more uniform punctuation, and by having less distinctly clavate thighs. From *Callidium vile* Lec., with which it might possibly be confused, it differs by being about twice as large, by having proportionally longer antennæ, the antennæ of the latter in both sexes just about reaching to the middle of the elytra, and by having black pile in place of gray.

Phymatodes decussatus Lec.

This species is decidedly variable. Large series bred from the California valley white oak, *Quercus lobata* Née, have yielded not only the phase with the prothorax and base of elytra rufous but the phase that is all black with the exception of the fasciæ, the *P. obliquus* Casey, as well as intermediates. Both phases are to be met with in various parts of middle and northern California. In Tulare Co., Cal., we have another phase or more properly a geographical race. This is like *obliquus* except that the anterior fasciæ are wanting and the posterior much reduced. This I would designate as the variety *posticus*. I have at present before me one from Camp Nelson, Tulare Co., Cal., collected July, 1913, which will serve as the type and three specimens belonging to Mr. Ralph Hopping. One of these is from Camp Greeley and two from Colony Mill, Tulare Co., Cal. No true specimens of *P. varius* Fab., with which the black phases of *decussatus* have been confused, have been seen from the Pacific Coast.

Phymatodes vulneratus Lec.

This species likewise has several color varieties and also varies greatly in size. In the cooler and more northern parts of its range, it is apt to be all black with the exception of the fasciæ, while in the valleys bordering on San Francisco bay, the specimens are more apt to have the base of the elytra, the meso- and metathorax and the legs rufous. It breeds in the Douglas fir, *Pseudotsuga taxifolia* Britt.

Phymatodes ater Lec.

Three specimens of this rare species, two received from Mr. H. W. Wenzel, from Five Mile Beach, New Jersey, and one from Mr. L. H. Weld, from Evanston, Ill., show that this species belongs to the fasciate group of the genus. In one of the New Jersey specimens, the fasciæ are lacking as is the case with the Le Conte type, in the other the anterior fasciæ are well defined and the posterior just vaguely indicated, while in the Evanston specimen, both sets of fasciæ are very distinct, very oblique, the posterior almost as oblique as the anterior. The characteristic coarse elytral punctuation which so readily distinguishes this species, is equally evident in all three.

Callimus hoppingi n. sp.

Rufo-castaneous, elytra piceous except at base, suture and outer margin, moderately pilose. Head finely, densely and shallowly punctured posteriorly; antennæ three fourths length of body, rather robust and pilose (decidedly more robust than in *cyanipennis* or *ruficollis*). Prothorax as broad as long, sides bluntly tuberculate at middle, dilated near apex, nearly straight and oblique from middle to base, disc shining, with a few fine punctures, fairly pilose and with the usual two blunt tubercles. Elytra more than twice as long as broad, slightly broader posteriorly, sides almost parallel, broadly rounded at apex, disc quite flat, smooth and shining toward base, finely rugose and subopaque at apical two thirds, rather finely sparsely punctate, the punctures distinct over basal area and more and more indistinct toward apex, clothed with moderately dense suberect pile. Beneath with anterior coxæ distinctly separated (much more so than in either *cyanipennis* or *ruficollis*), middle coxæ as widely separated as usual, the surface shining, very minutely and sparsely punctate, moderately pilose, and with the ventral segments as distinctly modified and of the same type as in the other members of the genus. Length 9.5 mm., breadth 3 mm.

Type, a female in my own collection, collected in the mountains of Placer Co., California. Three specimens, likewise females, which I have designated as paratypes, have been loaned to me for purposes of study by Mr. Ralph Hopping, after whom I take pleasure in naming it. Two of these, one from the Giant Forest, collected July, 1905, and the other from Kaweah, Cal., alt. 6,000 ft., collected June 18, are 11 mm. in length, the third from Kaweah, Cal., collected June 7, is but 8 mm. in length. All are fairly constant as to coloration and structure.

This species when compared with the other members of the genus, is seen to be not only more robust and of a different type of coloration, but more pilose, to have heavier antennæ, much less distinctly punctate elytra, and to have the prosternum between the anterior coxæ almost as wide as is the mesosternum between the second pair of coxæ. This last character taken in connection with some of the minor peculiarities might seem to be sufficient to justify its being placed in a new genus but the sum of the major characters are absolutely those of *Callimus* therefore I deem it wise to place it there.

Obrium californicum n. sp.

Castaneous, shining, very sparsely and finely pilose. Head about two thirds width of elytra, eyes moderately prominent, but widely separated above, the distance equalling one half the width of base of head [almost twice as widely separated as in *rufulum* Gahan (*rubrum* Newm.)]; antennæ longer than body in male and fully as long in female. Prothorax one third longer than broad at base, base and apex equal in width, widest at middle, sides slightly constricted in front of and behind median lateral tubercle, disc with a few sparse punctures and fine hairs. Elytra over twice as long as broad, sides straight and almost parallel, apices well rounded, the disc with basal two thirds distinctly punctured, the punctures separated in most cases by over their own width, the apex quite smooth, and the general surface covered with a fine, sparse, and hardly evident pile. Length 5 mm., breadth 1.75 mm.

Type, a male from Mineral King, Tulare Co., Cal., July 31, 1913, paratype from Alma, Santa Clara Co., Cal., in my own collection. Besides these I have critically examined two from the Big Trees, Calaveras Co., Cal., collected July 11 and 19, 1907, by Dr. F. E. Blaisdell and five collected by Mr. Ralph Hopping from Scafford Meadow, Tulare Co., Cal., July 8 and 10, 1910, Huckleberry Meadow, Fresno Co., Cal., alt. 6,500 ft., July 19 and Round Meadow, Giant Forest, July 10. One of the Scafford Meadow specimens was captured on Jeffrey pine. One of Dr. Blaisdell's specimens and one of Mr. Hopping's specimens, I have designated as paratypes. The entire series examined was uniform as to essential characters, but somewhat variable as to size, one female being 7 mm. in length.

This specimen is undoubtedly closely related to *O. rufulum* Gahan (*rubrum* Newm.), but it differs from that by being more castaneous in color, less red, by having the eyes smaller and more widely separated above, the elytral punctuation much finer and the pubescence decidedly finer and sparser.

Clytanthus pacificus n. sp.

Black, antennæ and legs rufous, middle of thighs somewhat piceous, and patches of yellow hair disposed as follows: along the margin of the entire pronotum, over the scutellum, as a lunate bar at the juncture of the anterior and middle third of the elytra, as a transverse line midway between this and apex, over a small area at the apex close to the suture, and at the posterior part of the meso- and meta-epimeron and along the posterior margins of the ventral segments. Head densely, coarsely and shallowly punctured; the antennæ one half length of body, the third joint twice as long as second. Prothorax broader than long and densely, coarsely and verrucosely punctate, the anterior border not distinctly elevated. Elytra subparallel and over twice as long as broad. Length 9 mm., breadth 2.5 mm.

Type from Marys Peak (near Corvallis), Or., and paratype, somewhat smaller, from Carrville, Trinity Co., Cal., June 15, 1913, in my collection. The paratype has faint subbasal pubescent spots in addition to the markings noted above.

This species is closely related to *C. ruricola* Oliv. but differs mainly by having the anterior margin of the prothorax less elevated, the antennal joints proportionately shorter, the anterior yellow bar of the elytra evenly and shallowly arcuate in contrast to the deep and angulate loop of the other and the posterior bar distinctly transverse, not oblique.

Clytus blaisdelli n. sp.

Black, antennæ and legs rufous, and ornamented with yellow pubescent markings disposed as follows: a narrow band margining the pronotum, on the scutellum, on the elytra in the form of a short oblique subbasal line, a lunate and transverse band at the middle, a narrow transverse band between this and apex and a small apical patch, and small areas on the meso- and meta-episterna and along the posterior part of each ventral segment. Head shallowly cribrately punctured, with a few scattered yellow hairs along the side of the front; the antennæ half the length of the body. Prothorax as broad as long, distinctly narrower than base of elytra, with sides evenly arcuate, disc coarsely, closely, verrucosely punctate, granulate and opaque, and with a few sparsely placed long hairs. Elytra slightly more than twice as long as broad, with sides straight and subparallel, apices subtruncate, disc closely punctate, densely clothed with a fine, closely appressed pile and with a collection of longer erect hairs in the scutellar region. Beneath clothed with a double type of pubescence, the closely appressed pile disposed as indicated and in addition a longer, sparser, and silkier pubescence generally distributed. Length 9 mm., breadth 3 mm.

Type in my own collection, collected by myself at Carrville, Trinity Co., Cal., June 4, 1913. Two other specimens, kindly loaned for study, have been designated at paratypes. One from Sonoma Co., Cal., belonging to the Museum of Comparative Zoölogy at Cambridge, Mass., has the prothorax a bit broader and the two median elytral bands somewhat narrower than in the type. The other, collected by Dr. F. E. Blaisdell, near Lagunitas, Marin Co., Cal., April 25, 1910, has the markings almost white. Both specimens are also slightly larger than the type, but except as noted, agree in all other particulars.

This very elegant and graceful species which I have named after my good friend, Dr. F. E. Blaisdell, agrees with *C. marginicollis* Lap. and *C. planifrons* Lec. in regard to all characters which are of generic importance, but differs specifically from both in being proportionally narrower and more elongate, the prothorax especially narrower, and in having the color pattern slightly different. The elytral bars are always much shorter and generally much narrower. The subhumeral patch is decidedly oblique, not transverse as it is in the other two, and but little more than a spot. The general facies of the species implies a much closer relationship to some of the European species like *C. arietis* L. or *C. lama* Muls. The arrangement of the elytral markings is, however, slightly different from either.

Neoclytus clitellarius n. sp.

Dark brown, antennæ and legs reddish; pilose, longer hairs, sparse, erect and more evident on head, prothorax, base of elytra and beneath, the shorter forming a closely appressed pubescence that is dense on the pronotum and elytra and somewhat sparser on underside, the pubescence of both types gray on the head, sides of prothorax and ventral surface, elsewhere brown except for the elytral maculations which are gray and consist of a transverse lozenge-shaped saddle across the middle of the elytra, two small spots on each elytron slightly posterior to middle and a quadrangular patch at the sutural apex. Head coarsely, closely punctate; the antennæ one half length of body. Prothorax as broad as long, distinctly narrower than base of elytra, apex slightly arcuate and overlapping head, sides gradually arcuate to base where slightly constricted, the disc with median longitudinal area slightly though distinctly gibbous, the surface rather closely punctate and granulate, the median granules faintly outlining transverse rugæ. Elytra twice as long as broad, apices subtruncate. Length 9.5 mm., breadth 3.25 mm.

Type in my own collection, secured near Fallen Leaf Lake, Lake Tahoe, Cal., July 18, 1915. A second specimen was observed among the unnamed beetles in the Horn collection, in the Philadelphia Academy of Sciences.

This very distinct species is clearly defined by the saddle like gray patch at the middle of the elytra and the four small spots behind. The general color scheme is like that of no other member of the *Clytini* with which I am familiar. The generic characters are not well developed, the transverse rugæ which are so prominent a feature in most of the species of the genus being here hardly indicated though the mid portion of the pronotum is quite gibbous. Because of this last character, it could not be placed in *Clytus* where one might otherwise be inclined to put it. The color pattern is also not that of the members of that genus.

Xylotrechus cinereus n. sp.

Black, clothed with a few long hairs scattered along sides of prothorax and on ventral surface and with short, cinereous pubescence distributed sparsely over the front of head, base of antennæ and legs, more densely over the sides of prothorax and entire under surface, especially marked along the posterior margins of the sclerites, both thoracic and abdominal, and formed into a well defined design on the elytra consisting of a short transverse bar slightly posterior to the base, a line running along the suture from the scutellum to the middle thence at right angles to the margin, a third transverse bar midway between this last and apex, often broken and with outer portion a bit more posteriorly, and with an additional general suffusion of gray over the basal area of elytra and scutellum and also over the apical half. Head granulate, moderately finely and evenly punctulate, frontal carinæ well defined; antennæ barely reaching the middle of body. Prothorax four fifths as long as broad, as broad as base of elytra, sides broadly rounded at middle, gradually narrowed apically and slightly constricted at base, disc granulate and punctate like head. Elytra over twice as long as broad, sides fairly straight and convergent toward apex, the apices obliquely truncate and pointed at tip, the disc rather finely closely punctate and with many fine transverse rugæ. Male, length 15 mm., breadth 5 mm.; female, length 18 mm., breadth 6 mm.

Type male and female in my collection, the male from near Fallen Leaf Lake, Lake Tahoe, Cal., July 26, 1915, taken on *Abies concolor* Lindl. and Gord. by myself, the female from Atwoods Mill, Tulare Co., Cal., July 29, 1913. A paratype male from Tallac, Eldorado Co., Cal., July 20, 1899, belongs to Dr. F. E. Blaisdell and another paratype male, with vestiture yellowish, but otherwise identical with the others, from Fallen Leaf Lake, Lake Tahoe, Cal., July 9, 1915, is in Mr. Ralph Hopping's collection. Numerous other specimens have also been seen.

This species which has been previously considered to be but a race of the widely distributed *X. undulatus* Say not only differs from that species by its color and distinctive color pattern but by having a different food tree. It always breeds in the true firs, *Abies,* as both Mr. Hopping and I have many times observed, whereas *undulatus* lives in either the true spruces, *Picea,* or their closer relative like *Pseudotsuga.* The pile of *cinereus* is usually white, is always more or less diffusely scattered over the prothorax and the basal and apical parts of the elytra, and the median markings of the elytra always follow the suture to about the middle then turn at right angles. The elytra are also proportionally narrower and the apices more distinctly pointed. In *undulatus,* the design, whether complete or not, is always more sharply defined against its background, there is an absence of that diffuse sprinkling of colored hairs over the surface, and the markings along the suture diverge considerably from it as they proceed backwards. At one time I was inclined to consider *cinereus* as but a western race of *X. fuscus* Kirby, a species which has been proven by Mr. C. A. Frost to feed on the true fir and as stated by Col. Casey[1] is quite distinct from *undulatus.* The color pattern of *fuscus,* is, however, quite different from that possessed by either *undulatus* or *cinereus,* the elytral markings in fresh and fully colored individuals consisting of a series of long and angular loops. In *cinereus,* the scutellum is always densely clothed with white hair while in the other two species, it is almost universally naked.

Xylotrechus insignis Lec.

This species is not only one of the most elegant in the genus but is remarkable in having the sexes so differently colored. It is widely distributed throughout California and runs well into Southern Oregon. The females which are black with rufo-castaneous antennæ and legs and variously barred with sharply defined yellow markings above, vary somewhat as to size and as to the breadth of the yellow markings, but as a whole may be considered to be fairly constant. The males, however, vary considerably. The typical male is rufous with the prothorax generally slightly margined with yellow both apically and basally, with a crescentic yellow patch transversely crossing the scutellum, a short yellow bar running inwards from the humeri, a transverse bar placed entirely across the elytra one third distant from the apex and a small poorly defined patch at the apex. This is the form which is generally to be found distributed throughout the middle portion of California and the Sierras. One specimen which I have seen from San Diego, is like the preceding, but with the markings white instead of yellow. In the northern counties and again in the south, the males have a tendency to have also a rather faintly defined crescentic line at the middle of the elytra and in addition a general suffusion of yellow hairs over the elytra. The specimens with the median markings are more common in the north and the specimens with the yellow suffusion best developed in the south as about Los Angeles. These are of course but mere races for typical forms are to be found with them as well as intergrades. Colonel Casey's *incongruus* is the northern suffused form and his *X. disruptus,* the female of one of the southern phases. There is also another and quite distinct race which was secured in numbers by Mr. F. W. Nunenmacher, at Kirby, Josephine Co., Or., June 11, 1910. The specimens were all males, of the usual rufous color with the prothorax, but slightly peppered with white hairs and the elytra sometimes with and sometimes without white oblique bars, with either transverse median white spots or bars, the subapical white bar always present, and in addition a general peppering of the surface with white hairs. This I consider a distinct geographical race for which I propose the subspecific name *nunenmacheri* after its discoverer. *Insignis* lives entirely in willow as far as I know and has the habit, particularly the males, of often resting on various plants like the thick-leaved milkweeds and mullens. Mr. J. J. Rivers was, I believe, the first to breed out the beetle from its food tree and prove the specific identity of the two sexes. I have also bred it and dug out colonies on numerous occasions and in various parts of the state. *X. obliteratus* Lec., described from Colorado and for some time considered to be the male of *insignis,* appeared to me, after a very careful examination of the type, to be rather more closely related to *X. mormonus* Lec., perhaps a phase of that Rocky Mountain species.

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[1] "Memoirs on the Coleoptera," III (1912), by Thos. L. Casey, p. 359.

Leptura scapularis n. sp.

Short, black, with triangular orange red patches at the humeri and a small tail-like appendage extending on to the epipleuræ, with short, rather sparse gray pile covering all of the body except the black portions of the elytra and most evident on the pronotum and underside, and a black pile covering the black parts of the elytra. Head with mouthparts but moderately prolonged, broad between the eyes, not very suddenly constricted back of eyes, with a broad neck, coarsely, densely punctate, opaque; antennæ moderately stout and extending slightly beyond middle of body. Prothorax campanulate, as broad as long, three fourths as broad as base of elytra, base twice as broad as apex, transverse basal impressions shallow, posterior angles short, narrow and extending directly outwards. Sides not dilated in front of middle, the disc closely, coarsely punctate and opaque. Scutellum rather finely punctate. Elytra twice as long as broad, humeral angles rounded and not very prominent, sides a bit arcuate and slightly convergent to apex, apices obliquely truncate, disc distinctly and moderately punctate. Length 8 mm., breadth 3 mm.

Type, a unique in my collection, captured at Havilah, Cal., June 19, 1905, by Mr. Fordyce Grinnell.

This very distinctly marked *Leptura* would come in our tables perhaps just before *L. sexpilota* Lec. The prothorax is of about the same type as in that species though the insect is as a whole somewhat larger, generally more robust and with an entirely different color pattern not only from that but from any having a similar shaped prothorax. Some few of our Lepturas have the humeri often with triangular patches of red as for instance an occasional *L. canadensis* Fab., a male of *L. lœtifica* Lec., and so forth, but these all differ very greatly from this otherwise. The species is evidently extremely local or else very rare as this is the only specimen that I have seen.

Leptura amabilis Lec.

This insect as shown by the type which I have recently critically examined is nothing more than one of the darker phases of *L. tribalteata* Lec. with the yellow bars reduced almost to spots. It is often found in the more northern parts of the range of the species. The name *amabilis* has priority over *tribalteata*. *L. coquilletti* Linnell is the extreme phase at the other end of the area of distribution and extreme in its color pattern as well. Intermediates have been seen which link all three together.

Leptura hirtella Lec.

This is merely the male of *L. tibialis* Lec., the latter name having priority by many years.

Leptura vexatrix Mann.

This species and *L. quadrillum* Lec. are merely northern and southern races of the same thing, *quadrillum* being the darker phase restricted to Washington, Oregon, and northwestern California, *vexatrix,* the lighter form of the more inland portions of northern California. They grade gradually into each other. *Vexatrix* has priority over *quadrillum.*

Encyclops californicus n. sp.

Castaneous, prothorax somewhat rufous, upper side of head and apices of middle and hind tibiæ and tarsi piceous. Head moderately finely, closely punctate, clothed with a very fine, short and sparse pubescence; antennæ slightly longer than body. Prothorax distinctly and closely punctate at sides, slightly less at base and apex, and almost smooth on disc, with a well-defined median longitudinal sulcus extending two thirds distance forward from base, lateral tubercles rounded and prominent, the prothorax distinctly broader through them than at base. Elytra three and a half times as long as broad, broadest at base, sides gradually convergent to apex, apices broadly rounded, disc flattened, rather coarsely and closely punctate, more finely apically and clothed with fine, short, and sparse hair. Beneath very finely punctured and pubescent. Length 9.5 mm., breadth 2.25 mm.

Type, a male in my collection, collected by myself in the Cañon near Lagunitas, Marin Co., Cal., June 4, 1911. Only one other specimen has been seen, a specimen in the Horn collection in the Philadelphia Academy, placed close to *Leptura quadricollis* Lec.

This species as far as generic characters and facies are concerned is typically an *Encyclops,* but it differs greatly specifically from *E. cœruleus* Say by being generally larger, of an entirely different color, by being distinctly though finely pilose, and by having the punctures less sharply defined. It is the first member of the genus to be found on the Pacific Slope.

Liopus barbarus n. sp.

Form robust, densely clothed above with cinereous pubescence, the elytra clouded with darker and lighter bands and spotted with black. Head cinereous, flat; the antennæ reaching several joints beyond the apex of the elytra and with the joints annulated at tip with black, the third joint long, the fourth slightly shorter, the fifth still shorter, and the sixth to the eleventh gradually shorter and narrower. Prothorax one third broader than long, surface cinereous with two darker spots on either side of middle, the sides with a prominent tubercle the greater portion of which is posterior to the middle, and which terminates in a slightly backward pointing spine, the disc with a faint longitudinal median sulcus. Elytra somewhat broader at base than prothorax, twice as long as broad, with sides almost parallel at basal half and gradually narrower at apical half, the apices rounded, the disc cinereous with a broad angulated darkly margined white bar just in front of the middle, a W-shaped black line between center and apex, a white area margined behind with black near apex and six rows of irregularly spaced black spots situated along the costæ. Body beneath and greater portion of legs densely clothed with a silvery white pubescence. Male, length 11 mm., breadth 2.5 mm.; female, length 13 mm., breadth 3.5 mm.

Type male and female in my collection, received from Mr. H. C. Muzzall who reared them at Carpenteria, Santa Barbara Co., Cal., April 20, 1918, from dead limbs of the California live oak, *Quercus agrifolia* Neé. Nine other specimens, also received from Mr. Muzzall, are in my collection and I have seen another collected by Mr. H. C. Kennedy on one of the Santa Barbara islands which is now in the collection of Cornell University. One of my paratypes will be deposited in the U. S. National Museum. The specimens vary only slightly and that chiefly as regards the intensity of the various shades of the color pattern.

This, the largest species of the genus in this country, resembles none of the other species very closely though it is perhaps closest to *L. variegatus* Hald. in structure. It also approaches *Leptostylus* and in color pattern simulates *L. nebulosus* Horn or in the matter of design even more closely *Acanthoderes decipiens* Hald. It is, however, a true *Liopus* as judged by its more typical characters for it possesses a but slightly clubbed first antennal joint, a distinctly spined prothorax, a triangular mesosternum and has the first tarsal joint of the hind tarsi longer than the next two.

Pogonocherus pilatei n. sp.

Robust, piceous, antennæ and bases of legs rufous, clothed with a gray pubescence, variegated with black on the elytra, with a few scattered longer hairs on the antennæ, legs and entire upper surface, the hair gray in the gray areas and black in the black patches. Head pubescent, the hairs either white or black; antennæ slightly longer than body in female and distinctly so in male and annulated. Prothorax broader at middle than long, lateral and discal prominences distinct but obtuse, the pubescence as on head. Elytra twice as long as broad, very convex, tricostate, the outer one distinct throughout length, the inner two distinct in apical half only though evident even across the ante-median gray saddle, the innermost developing into a black tufted tubercle at base, the apices rounded, the color pattern as follows: gray with a lunate black mark connecting the basal tubercles, a broad gray somewhat lunate saddle-like patch just posterior and extending to middle, this last margined posteriorly with oblique black lines which continue backwards along the innermost costæ for a short distance then turn and run obliquely outwards towards the margin, outlining triangular areas at the sides which are often more or less darkened, and with a few small black tufts scattered over the surface especially along the suture and the costæ. Beneath gray and unicolorous. The third tarsal joint of all legs padded beneath with yellow hair over almost the entire area, the first and second joints similarly padded over apical regions, the joints of the last pair of legs to a less degree though very evidently so. Male (a small specimen), length 6 mm., breadth 2 mm.; female (normal-sized specimen), length 8 mm., breadth 3 mm.

Type male and female in my collection, collected by Mr. G. R. Pilate from *Fremontodendron* (*Fremontia*) *californicum* Torr., at Havilah, Cal., May 30, 1913, and June 13, 1913. Seven other specimens, all females, collected at the same place, are also in my collection. The species is named after Mr. Pilate as a slight tribute for many favors.

The species resembles the more distinctly marked specimens of *P. californicus* Schaef., especially as regards its color pattern. It differs from the latter chiefly in having three distinctly defined elytral costæ, the outermost only in *californicus* being distinct, in having the tarsal joints, particularly the posterior ones, more fully padded beneath with yellow hair, the first and second tarsal joints of the last pair of legs in *californicus* having hardly a trace of yellow beneath, by having no yellowish hairs mixed with the gray as is the case with the other, by having a transverse black lunule just back of the scutellum, a triangular area at the middle of the elytra merely outlined with black, not solidly black, and by having in addition an oblique line running down the declivity. In addition the food plant is very different, that of *californicus* being the western yellow pine, *Pinus ponderosa* Dougl., of *pilatei*, the peculiar shrub, *Fremontodendron*.

All of the species of *Pogonocherus* that are found in California and probably also those found elsewhere are distinctly restricted to certain types of food plants. Besides those mentioned above, it has been found that *P. crinitus* Lec. is only found on the oaks, chiefly the California live oak; *P. oregonus* Lec. on the true firs, *Abies;* and *P. propinquus* Fall on the western yellow pine. *P. concolor* Schaef. is probably also found on pine and is besides, I am sure, only a color variety of *californicus.* I have a specimen of *concolor* that is more uniformly gray than is the type and have also many undoubted *californicus* that approach it. The majority of the northern specimens have the black median triangular areas almost as distinctly defined as is the black bar in *oregonus,* while others have it but vaguely indicated as is the case with the type. Fresh specimens of *californicus* also have long flying hairs on both antennæ and legs. Mr. Fall,[2] in his table where he stated the opposite, was misled by having to rely upon poor specimens.

A NEW SPECIES OF TYPHLOCYBA FROM ILLINOIS (HEMIPTERA, HOMOPTERA).

By J. R. Malloch, Urbana, Ills.

The type specimen of the species described herein is deposited in the collection of Illinois State Natural History Survey. The food plant of the species is unknown.

Typhlocyba rubriocellata sp. n.

Female.—Greenish yellow. Head, thorax, and scutellum without markings. Elytra with a large blood-red mark which does not reach base, costal, or inner margins and extends over one third of the distance to cross-veins; a rather broad infuscation in apices of the cells along proximal side of cross-veins and in those on inner and costal margins on distal side. Sheath of ovipositor tipped with black.

Head evenly rounded in front; vertex about twice as wide at posterior margin as its length at middle. Venation as in *querci.* Apical abdominal sternite with a small rounded notch in middle at apex.

Length, 3.75 mm.

Type: Augerville Grove, Urbana, Ill., June 20, 1919 (J. R. Malloch).

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[2] "New Species of Pogonocherus, with Synoptic Table," by H. C. Fall, Entom. News, Vol. XXI (January, 1910), p. 7.

NEW AND LITTLE-KNOWN SPECIES OF PHYTOCORIS FROM THE EASTERN UNITED STATES. (HETEROPTERA—MIRIDÆ.)[1]

By Harry H. Knight, University of Minnesota, St. Paul.

The present paper presents partial results of studies made in the genus *Phytocoris* in an effort to clear up the confusion surrounding the species in the *eximius* group. That there has been confusion need scarcely merit remark; still it might be added that the writer has before him no less than fourteen species, all of which have in previous years been determined by the best Hemiptera workers as *Phytocoris eximius*. Here is a group of species, all of which wear the same confusing cloak of dark and obscure colors, so similar in general appearance that several species can not be distinguished with certainty except by reference to the genital characters. If we are to separate the species consistently then we must get down to genital characters.

As a matter of fact after a little practice, any student can determine species more quickly by reference to the male claspers than by any descriptive process, and far more accurately. Ordinary word descriptions are useless in the *eximius* group and genitalia alone remain the sole guide for accurate determinations. The writer could only desire as other students, that all the species of *Phytocoris* were distinct and that simple tables could be devised to separate the species on other than genital structures but such does not seem feasible among the species of the *eximius* group. Perhaps after we have worked out the species by genitalia and come to know them by long series, certain superficial characters may be seized upon for distinguishing many of the species. In describing some of the new forms the descriptions are short, for the writer can point out only a few comparative color characteristics in addition to the genital structures, wherein the species may be said to differ from *eximius;* mere repetition of words would lead only to confusion.

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[1] Published with the approval of the Director as Paper No. 199 of the Journal Series of the Minnesota Agricultural Experiment Station.

A few of the species differ only very slightly in the genital claspers, and just enough to cause one to wonder if there could be such variation of size and structure within a species. In order to get additional evidence on this point the writer has made a careful study of the ædeagus and its chitinous parts and was rewarded by finding some very definite and interesting structures, characters which correlate perfectly with the small differences found in the claspers. In the genus *Phytocoris* the tip of the penis, or perhaps better called the median lobe of the ædeagus, contains a chitinous process, representing the terminal chitinous sclerite of that organ. After a careful comparison with the work of Sharp and Muir[2] on the structure of the ædeagus in Coleoptera, the writer feels sure that this terminal chitinous process can be homologized with that structure which they have designated as the *flagellum,* an armature of the internal sac of the median lobe. The species most closely related to *eximius* have a flagellum bearing strong chitinous teeth, which in various modifications give distinct specific characters, while in the species examined which have an irrorate or conspurcate membrane and are related to *inops* and *fumatus,* the *flagellum* is devoid of teeth yet has a distinctive shape in each species. The writer has examined from four to six males in most of the species and in no instance has found any variation in the structures that would lead to confusion between the most closely related species.

Specimens to be used for this purpose may be placed in a moist chamber and when sufficiently relaxed the genital segment may easily be removed by using two needles sharpened like chisels. The structures may then be picked out in a watch glass containing 30 per cent. alcohol, later to be mounted on a triangle placed on the pin beneath the insect. If we are to understand the variations or differences which we see in closely related forms we cannot afford to neglect a consideration of the structure of the ædeagus when working out the species. Once the species are worked out on this basis, no doubt superficial characters will be discovered which may be used for ordinary determination of the species.

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[2] Trans. Ent. Soc. London, 1912, pp. 477–642.

Phytocoris eximius Reuter. Caps. Am. Bor., p. 67, 1876.

♂. Length 5.7 mm., width 2 mm. *Head:* width .94 mm., vertex .35 mm.; yellowish, frequently tinged with reddish; geminate mark at base of tylus and apical half excluding a pale spot on each side opposite tips of loræ, upper margin of loræ, jugæ, bucculæ, and a ray passing lower margin of eye, reddish brown to fuscous or black; front clothed with long pale hairs. *Rostrum* (length 2.4 mm.) attaining basal margin of genital segment, yellowish, blackish toward the apex. *Antennæ:* I, length 1.28 mm., yellowish, irregularly mottled with fuscous, bearing five or six long pale setæ; II, 2.77 mm., fuscous, pale at base for a space of .17 mm., the infuscation distinctly paler on the middle third and becoming darker toward each end; III, 1.6 mm., dark fuscous, pale at base for space of .14 mm. and again very narrowly at apex; IV, 1.25 mm., blackish. *Pronotum:* length .91 mm., width at base 1.6 mm., anterior angles .57 mm., collar .64 mm.; side margins very slightly sulcate, gently rounded; disk moderately arched, an even contour maintained behind calli and at side margins, basal angles gently rounded; calli oval, slightly separated, delimited behind by an impressed margin, pale with one or two fuscous marks on the outer half; disk testaceous to fuscous, central area frequently grayish green, paler anteriorly, narrow basal margin pale, sub-basal margin with six blackish points that frequently join; disk distinctly hairy, longest at the anterior angles, hairs taking the color of the surface where they arise; collar pale, marked with reddish each side of the median line, bearing several prominent pale hairs; sides blackish, lower margin and a mark across the base of the coxal cleft, pale. *Scutellum* testaceous, a pair of diverging black vittæ just before the apex, becoming paler toward the median line; mesoscutum moderately exposed, sloping abruptly downward at the lateral angles; heavily clothed with a mixture of pale and yellowish pubescence. *Sternum* blackish, a pale ray on each side in line with the lower side margin of the pronotum; pleura fuscous, narrow margin of sclerites, basalar piece and orifice, pale. *Hemelytra:* clothed with prominent yellowish pubescence intermixed with groups of white deciduous tomentum, having black hairs arising from the dark markings; greenish gray to fuscous, corium with base, middle, a triangular spot just before the cuneus, several spots on the embolium, paler and more or less translucent; tip of embolium, an oblique or nearly triangular patch lying just inside of the cubitus at apex of corium, bordering the claval suture except on basal one third, fuscous to black; clavus more or less fuscous either side of the claval vein and bordering the claval suture. *Cuneus* grayish translucent, the apex, a small point along the inner margin and a second near the basal angle, black; the paler part usually showing some brownish or reddish coloration. *Membrane* fuscous, a large pale area just beyond the smaller areole and the tip of the cuneus, divided by a small fuscous spot which touches the margin; central area more or less invaded by paler, brachium distinctly pale at apex of areoles. *Legs:* coxæ and bases of femora pale; front and intermediate femora with a series of irregular reddish brown to fuscous spots; posterior femora blackish, forming the background for many large and small irrorations, the pale patches most numerous and broadly joined on the inner side, an irregular pale annulation a short space before the apex with a second nearer the middle but interrupted on the outside. Tibiæ annulated with fuscous and pale; the front pair banded with fuscous at apex, narrowly at the knee and twice between these points; intermediate pair with the apical band becoming pale, the whole apical half being more pale than fuscous; posterior pair infuscated, irregularly spotted with pale, broadly pale on the basal one third, delimited by blackish on the inner side at base and by a distinct annulation at the middle; spines pale to brownish; tarsi fuscous, arolia erect and diverging at the apices. *Venter:* clothed with prominent yellowish hairs, infuscated, yellowish on the ventral side except the genital segment which is narrowly pale along the median line and frequently at the sides near the base of the claspers. Genital claspers and flagellum distinctive of the species (pl. 1, fig. 1).

♀. Length 5.7 mm., width 2.05 mm. Very similar to the male in coloration; imperfect or poorly colored specimens can never with certainty be distinguished from the females of closely related species.

Plesiotype: ♂ July 15, Springfield, Missouri (H. H. Knight); author's collection. Specimens examined: 2 ♂, 1♀ July 15, Springfield, Mo. (H. H. Knight). 1 ♂, 1 ♀ July, Rabun Co., Ga. (Wm. T. Davis). ♂ July 1, Bluemont, ♂ Sept. 27, Glencarlyn, Va. (W. L. McAtee). ♀ June 25, Fairfax Co., Va. (Wm. T. Davis). 8 ♂, 2 ♀ July, Black Mts. N. C. (Beutenmuller.) ♂ June 30, Plummer's Is., Md. (O. Heidemann). ♀ Aug. 22, Sandy Hook, N. J. (Wm. T. Davis). 5 ♂, 15 ♀ July 29, 1 ♂, 5 ♀ July 30, 4 ♂, 5 ♀ July 31, 4 ♂, 6 ♀ Aug. 1, 1 ♂ Aug. 14, 2 ♀ Aug. 17, Batavia; 1 ♂, 1 ♀ July 23, Ithaca; 4 ♂, 1 ♀ July 26, McLean; 1 ♂ Aug. 9, Portage, New York (H. H. Knight). 1 ♂ July 26, 1 ♀ Aug. 28, Yaphank, N. Y.; 1 ♂ Aug. 9, Smithtown, L. Is., N. Y. (Wm. T. Davis). ♂ Aug 21, Wyandanch,

L. Is., N. Y. (Chris. E. Olsen). 2 ♀ Aug. 12–14, Portland, Conn. (B. H. Walden). 1 ♀ Aug. 5, East River, Conn (C. R. Ely). 1 ♂ July, Woods Hole; 1 ♂ Aug. 8, Chester; 1 ♂ Aug. 9, Riverside; 1 ♂ Aug. 15, Sunderland; 1 ♂ Aug. 19, Swampscott; 1 ♀ Sept. 27, Northampton, Mass. (H. M. Parshley). 1 ♀ Sept. 12, Casco Bay, Me. (G. P. Engelhardt). 5 ♂, 7 ♀ Aug. 6–8, Parry Sound, Can. (H. S. Parish).

This species is found on a number of plants in various situations, and is largely if not wholly predaceous as are a number of closely related species in this group.

The writer's determination of the species is based on a comparison of male claspers with a specimen which Reuter determined as *eximius* in 1909 by comparison with the type in the Stockholm Museum. This specimen was returned to the late Mr. O. Heidemann at the U. S. National Museum and was used by him as a basis for determinations of *eximius*. The redescription that Reuter gives for *eximius* in 1909[3] is evidently drawn from other specimens, doubtless retained by him, and apparently refers to a different species, a form with irrorate membrane.

From the standpoint of wide distribution and determinations by Reuter and Heidemann, the species here described and figured is more likely to prove identical with *eximius* when comparison with the type is made, than any other species of the several recorded as *eximius* from the eastern United States. It is entirely possible that the type *eximius* may prove to be a species distinct from any occurring east of the Mississippi river, thus no final disposal of the species may be had until some competent systematist examines carefully and records the genital claspers of the type, which fortunately is a male.

Phytocoris brevifurcatus new species.

♂. Length 5.8 mm., width 2.14 mm. Very similar to *eximius* but without the heavy oblique fuscous mark at apex of corium; second antennal segment darker fuscous on the middle third; head and pronotum distinctly grayish green on the paler parts; posterior femora with smaller irrorations, not distinctly banded with pale; genital claspers and ædeagus distinctive of the species (pl. 1, fig. 2).

Holotype: ♂ Aug. 6, Batavia, N. Y. (H. H. Knight); author's collection. *Allotype:* Aug. 24, Batavia, N. Y. (H. H. Knight). *Paratypes:* ♂ July 31, 3 ♂ Aug. 2, ♂ Aug. 4, ♂ Aug. 29, ♀ Aug. 30, Batavia, N. Y. (H. H. Knight). Specimens were taken on the bark of trees in shaded situations.

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[3] "Bemerkungen über Nearktische Capsiden," etc., Acta. Soc. Sci. Fennicæ, xxxvi, No. 2, p. 23, 1909.

Phytocoris neglectus new species.

> ♂. Length 6.2 mm., width 2.2 mm. Resembles *eximius,* but the second antennal segment is uniformly blackish except for the whitish annulation at the base; corium and clavus frequently more broadly blackish; apical band on the middle tibiæ white; infuscation at middle of membrane tending to separate into small specks; genital claspers and ædeagus distinctive of the species (Pl. 1, Fg. 3).

Holotype: ♂ June 25, Batavia, New York (H. H. Knight); author's collection. *Allotype:* same data as type. *Paratypes:* ♀ June 18, ♀ June 25, 2♀ July 1, ♂♀ July 5, ♂ July 6, ♀ July 11, ♂ July 14, ♂ July 15, ♀ July 22, ♀ Aug. 5, ♂ Aug. 25, ♀ Aug. 29, ♂♀ Aug. 30, 2 ♂ Sept. 7, ♂ Sept. 13, Batavia; 2 ♂ Sept. 14, Wyoming, N. Y. (H. H. Knight). 3 ♀ July 4, Four Mile, N. Y. (H. H. Knight). ♂ Aug. 3, White Plains, N. Y. (J. R. de la Torre-Bueno). ♂ Sept. 20, Amagansett, L. Is., N. Y. (Wm. T. Davis). 2 ♂ July 30, Pigeon Cove; 3 ♂ July 15–Aug. 6, Woods Holl, Mass. (Chris. E. Olsen). ♂♀ Sept. 16–17, ♂ Sept. 30, Forest Hills; ♂ July 13, Swampscott, ♂ Aug. 31, Beach Bluff, ♂, 3 ♀ Sept. 5, Saugus, ♂, 2 ♀ Sept. 15, Blue Hills, ♀ Oct. 3, Squantum, ♂ Oct. 13, Boston, ♂ Oct. 21, Hyde Park, Mass. (H. M. Parshley). ♂ July 26, N. E. Harbor, Me. (C. W. Johnson). ♂ Sept. 2, New Buffalo, Berrien Co., Mich. (R. F. Hussey). ♂ June 29, Twin Lake, Martin Co., Minn. (H. H. Knight).

Apparently there are two generations of this species in one season. The writer took specimens most frequently on the bark of apple trees where both nymphs and adults fed on Psocids. The species was also found on the bark of other trees and is probably predaceous on most soft bodied insects living in such situations.

Phytocoris onustus Van Duzee. Proc. Calif. Acad. Sci., ser. 4, ix, p. 344, 1920.

Figure of genital claspers and flagellum (pl. 1, fig. 9).

Plesiotype: ♂ July 31, Batavia, New York (H. H. Knight);

author's collection. Specimens examined: ♀ July 7, ♀ July 11, 2 ♀ July 29, 3 ♀ July 30, 5 ♀ July 31, Batavia; ♂ Aug. 9, Portage; 3 ♂, 3 ♀ Four Mile; ♂ July 26, Ithaca, New York (H. H. Knight). ♀ July 15–Aug. 6, Woods Hole, Mass. (Chris. E. Olsen). ♀ Aug. 8, Mt. Toby, Sunderland, Mass. (H. M. Parshley). ♂ July 24, Glen House, N. H.; ♂ July 22, Machias, Me. (C. W. Johnson). ♀ Aug. 22, Mt. Katahdin, Me., alt., 650 ft. (C. P. Alexander) 2 ♂, ♀ June, Clayton, Ga., alt. 2000–3700 ft. (Wm. T. Davis).

The writer took this species most frequently on the bark of hickory trees in shaded humid surroundings. The color of the insect matches the bark so closely that it is difficult to see when crouching in crevices on the bole of the tree.

Phytocoris spicatus new species. (10)

♂. Length 6 mm., width 2 mm. Slightly larger than *eximius* and more broadly black; second antennal segment uniformly black except for the white annulation at base; front largely black, transverse striæ evident; hind femora as in *eximius* only darker, one distinct pale annulation just before the apex; flagellum and right genital clasper distinctive of the species (pl 1, fig. 10).

♀. Length 6.8 mm., width 2.2 mm.; very similar to the male only slightly larger.

Holotype: ♂ July 14, Batavia, New York (H. H. Knight); author's collection. *Allotype:* Aug. 1, Batavia, New York (H. H. Knight). *Paratypes:* ♂ July 19, Machias, Me. (C. W. Johnson). ♂ July 15, Lunenburg, Mass. (H. W. Allen).

This species comes nearest to *cortitectus* but is readily distinguished by the sharp basal spike on the right clasper and the darker coloration; also approaches *onustus* but is smaller and more blackish.

Phytocoris cortitectus new species.

♂. Length 6 mm., width 2 mm. Very similar to *eximius;* pale parts of the hemelytra more translucent, infuscations paler; front of head transversely striate with fuscous each side of the median line; second antennal segment more uniformly fuscous, but with a pale reflection apparent throughout the infuscation; genital claspers and ædeagus distinctive of the species (Pl. 1, Fig. 11).

♀. Very similar to the male but slightly more robust.

Holotype: ♂ July 31, Batavia, New York (H. H. Knight); author's collection. *Allotype:* taken with the type. *Paratypes:* 2 ♂ July 29, 2 ♀ July 30, 2♂, ♀ July 31, Batavia, N. Y. (H. H. Knight). ♂ July 24, Glen House, N. H. (C. W. Johnson).

The writer took specimens only on the trunks of elm trees (*Ulmus*) where the species is admirably concealed as it crouches in crevices of the bark.

Phytocoris lacunosus new species. (4

♂. Length 6.7 mm., width 2.2 mm. Very similar to *corticectus* only larger; nearly the size of *onustus* but more slender and paler in color; corium with a longitudinal pale area which extends onto the base of the cuneus without interruption at the cubitus; flagellum and right genital clasper distinctive of the species (Pl. 1, Fig. 4).

Very similar to the male only slightly more robust.

Holotype: ♂ July 27, McLean, New York (H. H. Knight); author's collection. *Allotype:* taken with the type. *Paratypes:* ♂, 2 ♀ topotypic.

All the specimens were taken on the bark of *Carpinus caroliniana* found growing at the margin of Round Bog near McLean, N. Y.

Phytocoris salicis new species.

♂. Length 6 mm., width 2.1 mm. Very similar to *eximius* but distinctly brownish above; fuscous coloration of the hemelytra interspersed with brownish maculations; second antennal segment more distinctly pale fuscous, becoming dark only at apex and next to the pale basal annulation; membrane paler on the central area and with a median pale ray extending to apex; genital claspers and flagellum distinctive of the species (Pl. 1, Fig. 13).

♀. Very similar to the male in size and coloration.

Holotype: ♂ July 31, Batavia, New York (H. H. Knight); author's collection. *Allotype:* taken with type. *Paratypes:* 2 ♂, 1 ♀ July 13, 2 ♂, 3 ♀ July 25, 1 ♂, 5 ♀ July 29, 1 ♂, 3 ♀ July 30, 1 ♂ July 31, 2 ♀ Aug. 1, 2 ♂, 1 ♀ Aug. 2, ♂, 3 ♀ Aug. 6, 5 ♂, 5 ♀ Aug. 10, 2 ♀ Aug. 17, ♂ Aug. 20, Batavia; ♀ Aug. 2, Honeoye Falls; 2 ♂ July 24, 2 ♂ July 26, Ithaca; ♂, 2 ♀ July 27, McLean, New York (H. H. Knight). ♂ July, Orient, L. Is., N. Y. (Wm. T. Davis). ♀ July 22, Ridgewood, N. J. (M. D. Leonard). 3 ♀

July 29, Pigeon Cove; ♀ Aug. 3, Oak Bluff; 3 ♂, 2 ♀ July 15–Aug. 6, Woods Hole, Mass. (Chris. E. Olsen). ♂ July 4, Brookline; ♂♀ July 8, Mt. Toby, Sunderland; ♂ July 22, Lunenburg; ♂ Aug. 11, Beach Bluff, Mass. (H. M. Parshley). ♂ July 3, ♀ July 15, Bradford, Ct. (H. W. Winkley). ♀ July 3, Hanover, N. H.; ♀ July 26, Machias, Me. (C. W. Johnson). 4 ♂, 1 ♀ June 20–July 4, Berrien Co., Mich. (R. F. Hussey). ♂, 2 ♀ June 29, Twin Lakes, Martin Co., Minn. (H. H. Knight). ♂ July 2, Mille Lacs Co., Minn. (V. R. Haber). 1 ♂, 2 ♀ Aug. 8, Parry Sound, Can. (H. S. Parish).

The writer took this species only on willow, chiefly *Salix nigra* where the species appears to be predaceous on soft-bodied insects living on the willow.

Phytocoris buenoi new species.

> ♂. Length 5.8 mm., width 2 mm. Resembles *eximius* but the colors of the dorsum are more contrasty; front and middle femora dark fuscous brown, closely and irregularly maculated with pale; black patch bordering the brachium strongly contrasted with the pale spot which joins the base of cuneus, pale part of cuneus tinged with roseous; central area of membrane distinctly pale; male claspers and flagellum distinctive of the species (pl. 1, fig. 14).
>
> ♀. Very similar to the male in size and coloration.

Holotype: ♂ July 3, White Plains, New York (J. R. de la Torre-Bueno); author's collection. *Allotype:* taken with the type; collection of Mr. Torre-Bueno. *Paratypes:* 2 ♀ topotypic. ♂ June 27, New Haven, Conn. (W. E. Britton). ♀ July 15–Aug. 6, Woods Hole, Mass. (Chris. E. Olsen). ♂ July 24, Marblehead, Mass. (H. M. Parshley).

Adults and nymphs were taken on Norway Spruce (*Picea excelsa*) by Mr. Torre-Bueno, in honor of whom the species is named.

Phytocoris erectus Van Duzee. Proc. Calif. Acad. Sci., ser. 4, ix, p. 345, 1920.

Plesiotype: ♂ Aug. 24, Batavia, N. Y. (H. H. Knight); author's collection. Figure of genital claspers and flagellum (pl. 1, fig. 5). Specimens examined: ♂ Aug. 13, Cattaraugus Co., N. Y., alt. 2,300 ft. (H. H. Knight). ♂ July 15, ♂ Aug. 10, ♂ Sept. 16, Cranberry Lake, N. Y. (C. J. Drake). 2 ♂ July 18, Springfield, Mo.; 2 ♂, 1 ♀ June 12, LeRoy, Ala. (H. H. Knight). ♂ July 28, Plymouth, ♂ Aug. 8, Chester, ♂ Sept. 25, Brookline, Mass.; ♀ Sept. 28, Crawford's, N. H. (H. M. Parshley). ♂♀ Aug. 14, Ft. Kent; ♂ Aug. 1, Penobscot Co., Me. (C. W. Johnson). ♂ July 26, Cogebic Co., Mich. (T. H. Hubbell). ♂ Aug. 28, Bald Eagle Lake, St. Louis Co., Minn. (H. H. Knight).

Phytocoris penipectus new species. ✓2

♂. Length 5.1 mm., width 1.9 mm. Very similar to *eximius;* second antennal segment uniformly infuscated except the pale annulus at base; apical half of corium and bordering the claval vein, distinctly olive green; flagellum and genital claspers distinctive of the species (pl. 1, fig. 12).

♀. Length 5.5 mm., width 2 mm. Very similar to the male in coloration, but slightly more robust.

Holotype: ♂ Sept., East River, Connecticut (C. R. Ely); author's collection. *Allotype:* topotypic. ♀ Sept., New Canaan, Ct. (W. E. Britton). ♀ Amherst, Mass.

Phytocoris pectinatus new species.

♂. Length 4.8 mm., width 1.77 mm. Very similar to *eximius,* colored more as *penipectus* but more strongly invaded with green on the corium, clavus, and scutellum; second antennal segment black except at base; genital claspers and flagellum distinctive of the species (pl. 1, fig. 18).

Holotype: ♂ May 9, Gainesville, Florida (C. J. Drake); author's collection. *Paratype:* ♂ Sept. 25, Silver Springs, Fla. (G. P. Engelhardt); this specimen has lost most of the green color and is probably from a second generation.

Phytocoris obtectus new species.

♂. Length 5.5 mm., width 1.85 mm. Very similar to *eximius* but slightly smaller and more slender; hemelytra more uniformly grayish translucent, not distinctly marked with fuscous at apex of corium; front transversely striate with fuscous; scutellum grayish brown and irrorated with paler; genital claspers and flagellum distinctive of the species (pl. 1, fig. 21).

♀. Very similar to the male in size and coloration.

Holotype: ♂ June 27, Honeoye Falls, New York (H. H. Knight); author's collection. *Allotype:* same data as type. *Paratype:* ♀ topotypic.

Phytocoris mundus Reuter. Bemerk. Neark. Caps., p. 18, 1909.

Figure of male genital claspers and flagellum (pl. 1, fig. 22).

Plesiotype: ♂ June 29, Dyke, Va. (Wm. T. Davis); compared with type; author's collection.

Phytocoris fulvus new species.

♂. Length 6 mm., width 2 mm. Similar to *mundus* but is larger, more elongate and paler in color; pale yellowish, darkened with fulvous on the exterior half of clavus and inner half of corium; antennal segments III and IV blackish, apex of II infuscated; apical half of femora perceptibly darkened through which small pale irrorations are visible; membrane pale, uniformly tinged with fumate, the veins fulvous; genital claspers and flagellum distinctive of the species (pl. 1, fig. 23).

♀. Very similar to the male in size and coloration.

Holotype: ♂ July 26, Ithaca, New York (H. H. Knight); author's collection. *Allotype:* topotypic. *Paratypes:* 4 ♂, 9 ♀ taken with the types. ♀ July 31, Peak's Island, Me. (G. A. Moore). 4 ♂, 1 ♀ Aug. 8, Cranberry Lake; ♀ Aug. 7, Wanakena, N. Y. (C. J. Drake).

The type specimens and nymphs were taken on white pine (*Pinus strobus*).

Phytocoris pinicola new species. ⑦

♂. Length 5.2 mm., width 1.8 mm. In coloration most suggestive of *conspersipes* but genital structures show it more closely related to *mundus;* more slender than *conspersipes,* spots on femora and tibia less distinct, orange yellow; genital claspers and flagellum distinctive of the species (pl. 1, fig. 17).

♀. Similar in coloration to the male, but shorter and more robust.

Holotype: ♂ July 14, Batavia, New York (H. H. Knight); author's collection. *Allotype:* topotypic. *Paratypes:* 1 ♂, 5 ♀ topotypic.

Taken on *Pinus silvestris* near Batavia, N. Y. This species may prove to be an importation but the writer was unable to locate it in the literature.

Phytocoris conspersipes Reuter. Bemerk. Neark. Caps., p. 22, 1909.

Figure of male genital claspers and flagellum (pl. 1, fig. 19).

Plesiotype: ♂ June 29, Corner Conduit and Potomac Roads, Md. (W. L. McAtee), taken on *Pinus virginiana;* compared with type; author's collection.

Phytocoris conspersipes diversus new sub-species.

♂. Length 5 mm., width 1.7 mm. Structurally, nearly identical with *conspersipes* but is more slender; general aspect more nearly that of *fulvus,* the fulvous coloration more distinct on the inner apical half of the corium and on cuneus; head, pronotum, and ventral parts greenish, pronotum basally, sides of tylus, upper margins of jugæ and loræ, base of head, indistinct transverse striæ on front, sternum and sides of venter, tinged with reddish brown; femora except basally and tibiæ, fusco-brownish, irrorate with pale, spots much enlarged on upper side of posterior femora. *Head:* width .97 mm., vertex .37 mm. *Antennæ:* I, length .71 mm., greenish, darkened with fusco-brownish, irrorate with paler on inner side, beset with 9 or 10 dark bristles; II, 2.05 mm., infuscated, paler on basal half; III, 1.05 mm., blackish; IV, .85 mm., blackish. Length of segment II slightly greater than twice the width of head; in *conspersipes* the length of segment II is slightly less than twice the width of head. Genital claspers and flagellum nearly identical with those of *conspersipes* (pl. 1, fig. 20); such would seem to indicate a subspecific relationship.

♀. Very similar to the male in size and coloration.

Holotype: ♂ Sept. 1, Madison Barracks, New York (H. H. Knight); author's collection. *Allotype:* taken with the type. *Paratypes:* 3 ♂, 8 ♀ topotypic; 5 ♂ July 26, ♀ Sept. 12, Ithaca, N. Y.; 1 ♂, 4 ♀ Aug. 22, Whiteface Mt., New York (H. H. Knight); all taken on *Pinus strobus.* ♂ Sept. 16, Liberty, Me. (Cushman). ♂, Franconia, N. H. (Mrs. A. T. Slosson). ♀ Aug. 1, "Hatch Exper. Station," Mass.

Phytocoris quercicola new species.

♂. Length 4.7 mm., width 1.7 mm. Suggestive of *puella* but the heavy infuscation on pronotum and legs distinguish this form at once. *Head:* width .91 mm., vertex .3 mm., basal half of loræ, spot each side of tylus, transversely across the front and four marks on vertex, red, front with prominent pale hairs; rostrum (length 2.2 mm.) attaining base of genital segment, pale, infuscated at apex. *Antennæ:* I, length .97 mm., pale, three irregular marks on upper side and broadly banded at apex with fusco-brownish or reddish, beset with 6 to 8 prominent pale spines: II, 2.25 mm., pale brownish, pale annulus at base, next to this and again at apex darker fuscous; III, 1.25 mm., fusco-brownish, annulated with paler at base, middle and narrowly at apex; IV, 1.04 mm., fuscous. *Pronotum:* nearly as in *eximius,* longest hairs situated anteriorly and on collar; outer half of calli and extending broadly to the rear, narrowing and curving inward to form submarginal line on middle two fourths, interrupted at median line, fusco-brownish to dark fuscous; submarginal line frequently forming two blackish points each side of the median line, narrow basal margin pale; scutellum pale, median line frequently reddish, each side of this an indistinct vitta composed of small brownish dots. *Hemelytra:* pale, more or less translucent, an irregular patch at middle of clavus and a larger one just opposite on the corium, fusco-brownish, the dark color broken by small irregular pale maculæ; frequently the apex of corium with a second smaller dark patch and a series of fusco-brownish spots bordering the claval suture; embolium and cuneus flecked with coagulate spots of reddish. Membrane pale, infuscation composed of fine irregular spots, forming a large spot on apex, a smaller one at each side joining margin, the central area and within the cells more sparsely speckled with irregular flecks of fuscous; brachium pale, cubitus infuscated. *Legs:* front and middle tibiæ pale, triannulate with fuscous, femora and hind tibiæ marked nearly as in *eximius,* infuscation frequently becoming reddish brown. *Venter:* pale, side flecked with reddish, basal half of genital segment fuscous except along median line; flagellum and genital claspers distinctive of the species (Pl. 1, Fig. 24).

♀. Very similar to the male in size and coloration.

Holotype: ♂ Aug. 12, Batavia, New York (H. H. Knight); author's collection. *Allotype:* same data as type. *Paratypes:* 41 ♂♀ taken with the types; 1 ♂ Aug. 1, 3 ♂ Aug. 10, 1 ♂, 1 ♀ Aug. 11, 5 ♀ Aug. 15, Batavia, N. Y. (H. H. Knight). ♀ Aug. 27, Beach Bluff, Mass. (H. M. Parshley). ♂ Aug. 12, Odenton, Md.; ♂ Sept. 27, Glencarlyn, Va. (W. L. McAtee); other specimens from the same localities in Mr. McAtee's collection.

The writer took this species only on bur oak (*Quercus macrocarpa*) to which tree it appears to be restricted in its breeding habits.

Phytocoris conspurcatus new species.

♂. Length 5.9 mm., width 2.1 mm. Resembling *eximius* in form of pronotum and general coloration only usually darker; readily distinguished by the dark conspurcate membrane, antennal segments II and III banded at the middle with pale; dorsum thickly clothed with black deciduous scale-like hairs intermixed with small patches of white tomentum. *Head:* width 1.06 mm., vertex .34 mm., infuscated similarly to *eximius;* rostrum (length 2.6 mm.) attaining the base of the genital segment. *Antennæ:* I, length 1.2 mm., black, irregularly irrorate with white, beset with from 14 to 16 pale setæ; II, 2.5 mm., black, annulated at base with pale, a second band beginning at middle and covering a space of .3 mm. on base of apical half; III, 1.48 mm., pale at base and again at middle; IV, 1.11 mm., black. *Pronotum:* length 1.54 mm., width at base 1.7 mm.; form and coloration very similar to *eximius,* but differs by the presence of black scale-like hairs; scutellum thickly covered with white tomentum. *Hemelytra:* more uniformly darkened than in *eximius,* a pale triangular spot at tip of corium bordering the cuneus; thickly clothed with black scale-like hairs intermixed with small patches of white tomentum. Membrane thickly conspurcate with dark fuscous, brachium pale at apex of larger areole, conspurcate spots more sparsely placed near apex of the cells. *Legs:* marked very similar to *eximius,* pale band near apex of hind femora more or less interrupted on the under side. *Venter:* dark fuscous to blackish, more or less pale on under side at base; genital claspers and the long tubercle above base of the left clasper, distinctive of the species (pl. 1, fig. 16).

♀. Very similar to the male in size and coloration.

Holotype: ♂ Aug. 17, Batavia, New York (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* 4 ♀ topotypic. 3 ♂ July 30, ♀ Aug. 3, ♂ Aug. 12, ♂ Aug. 18, Batavia, N. Y.; ♀ Sept. 8, Ithaca, N. Y. (H. H. Knight). ♂ June 20, Washington, D. C. (O. Heidemann). ♀ Aug. 21, L. Is., N. Y. (Chris. E. Olsen). ♀ Aug. 3, Wallingford, Ct. (D. J. Caffery). ♀ Sept. 12, Hartford, Ct. (W. E. Britton). ♂ Aug. 9, Boston; ♂ Aug. 24, Beach Bluff, Mass. (H. M. Parshley). ♂ July 25, Mercer Co., Ohio; ♂ July 19, Ann Arbor, Mich. (R. F. Hussey). ♀ Aug. 13, St. Anthony Park, Minn. (H. H. Knight). 1 ♂, 1 ♀ Aug. 6, 2 ♂ July 11, Trenton, Ontario, Can. (Evans). ♀ July 4, White Plains, N. Y. (Torre-Bueno).

This is a predaceous, bark-inhabiting species which the writer took on the boles of Linden (*Tilia*), Pear (*Pyrus*), and Maple (*Acer*).

Phytocoris fumatus Reuter. Bemerk. Neark. Caps., p. 25, 1909.

Figure of male claspers and flagellum (pl. 1, fig. 8).

Plesiotype: ♂ June 26, Deep Pond, Wading River, L. Is., New York (Wm. T. Davis); compared with type; author's collection.

The writer has studied the types of *fumatus* and *subnitidulus* that were returned by Reuter to the U. S. National Museum and is unable to see more than a shade of color difference between them. It is possible that the other type specimen of *subnitidulus* which Reuter retained, may represent something different from *fumatus,* but on the other hand, a study of the original description does not reveal any differences greater than may be found in the sexes of the latter species.

Phytocoris corticevivens new species.

♂. Length 6.6 mm., width 2.3 mm. Very similar to *fumatus,* differs in having the lower half of head black except for a small pale spot at base of loræ; femora black, narrowly pale at base, a few small pale freckles near apices, the hind pair with a distinct white oblique band just before the apex, broader and more distinct at the front and under side; genital claspers, flagellum, and tubercle above base of each clasper, distinctive of the species (pl. 1, fig. 6).

♀. Very similar to the male but slightly more robust, frequently lighter colored.

Holotype: ♂ July 11, Batavia, New York (H. H. Knight); author's collection. *Allotype:* taken with the type. *Paratypes:* ♂ June 8, ♂ June 25, ♂ July 13, ♀ July 14, Batavia; ♂ June 21, Portage, N. Y. (H. H. Knight). ♂ July 7, Waterville, N. Y. (I. M. Hawley). ♀ July 11, Staten Island, N. Y.; ♀ June 30, White Plains, N. Y. (Torre-Bueno). ♀ July 3, Palisades, N. J. (Wm. T. Davis). ♂ July 2, Great Falls, Md. (O. Heidemann). ♂ June 20, New Haven, Ct. (A. B. Chaplain). ♀ July 4, Lyme, Ct. (H. B. Kirk). ♀ July, Orono, Me. ♂ June 2, Ramsey Co., Minn.; ♂♀ "Minn.". ♂ July 1, Kingsmere, P. Q., Can. (R. N. Crystal). ♂ Henningford, P. Q.; ♀ July 3, Covey Hill, P. Q. (C. E. Petch).

The writer took this species only on the bark of maple trees (*Acer saccharum*) where the nymphs and adults are well concealed as they crouch in crevices of the bark awaiting their prey.

Phytocoris tuberculatus new species.

♂. Length 6.5 mm., width 2.1 mm. Very similar to *fumatus,* especially in the white coloration on lower half of head; first antennal segment (length 1.42 mm.), equal to the distance from base of pronotum to a line drawn through the middle of eyes, and in this respect is identical with *fumatus;* distinguished by having all the femora black, posterior pair with an oblique pale band near apex and adjacent to this a few small pale freckles as in *corticevivens.* Genital claspers, flagellum, a long tubercle above base of left clasper and a shorter one above the right clasper, distinctive of the species (pl. 1, fig. 7).

♀. Very similar to the male but slightly more robust, frequently lighter colored.

Holotype: ♂ July 5, Four Mile, New York (H. H. Knight); author's collection. *Allotype:* June 4, Black Mts., N. C. (Beutenmuller); Cornell University collection. *Paratypes:* ♂ July 5, Four Mile, N. Y. (H. H. Knight). ♂ June, Pine Island, N. Y. (Wm. T. Davis). ♀ July 19, Ann Arbor, Mich., at light (R. F. Hussey).

The writer would have been inclined to identify this species as *subnitidulus* but for the fact that the type specimen in the U. S. National Museum is certainly identical with the type of *fumatus* and in the original description no mention is made of the distinct pale band near the distal end of the posterior femora.

Phytocoris sulcatus new species.

♂. Length 6 mm., width 1.8 mm. Very similar in form to *fumatus* but smaller; pronotum more distinctly sulcate at sides and immediately behind the calli; pale annulations more distinct at base and middle of segment II; dorsum distinctly paler, exterior half of clavus and inner apical angles of corium blackish; femora broadly pale at base, irrorate with large pale spots on the apical half. Genital claspers, flagellum, a large thick tubercle above the base of the left clasper, distinctive of the species (pl. 1, fig. 15).

♀. Very similar to the male in coloration, more robust, the sides of the hemelytra distinctly rounded.

Holotype: ♂ Aug. 10, Batavia, New York (H. H. Knight); author's collection. *Allotype:* Aug. 1, Batavia, N. Y. (H. H. Knight). *Paratypes:* ♀ Aug. 1, ♀ Aug. 3, ♀ Aug. 5, Batavia; ♂ July 21, Ithaca (at light); 2 ♀ Sept. 1, Madison Barracks,

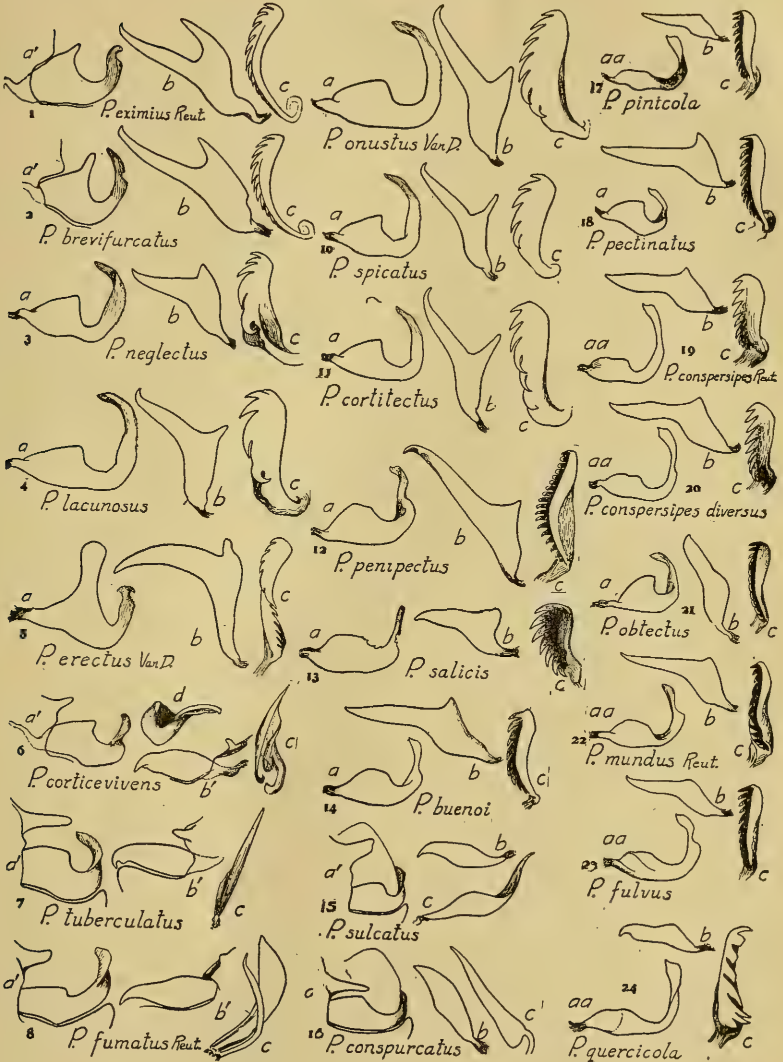
a'
b
c
1
P. eximius Reut.
a'
b
c
2
P. brevifurcatus
a
b
c
3
P. neglectus
a
b
c
4
P. lacunosus
a
b
c
5
P. erectus VanD.
a'
d
c1
b'
6
P. corticevivens
a'
b'
c
7
P. tuberculatus
a'
b'
c
8
P. fumatus Reut.
a
P. onustus VanD.
b
c
a
b
c
10
P. spicatus
a
b
c
11
P. cortitectus
a
b
c
12
P. penipectus
a
b
c
13
P. salicis
a
b
c1
14
P. buenoi
a'
b
c
15
P. sulcatus
c
c'
b
16
P. conspurcatus
aa
b
c
17
P. pinicola
a
b
c
18
P. pectinatus
aa
b
c
19
P. conspersipes Reut.
aa
b
c
20
P. conspersipes diversus
a
b
c
21
P. obtectus
aa
b
c
22
P. mundus Reut.
aa
b
c
23
P. fulvus
b
aa
c
24
P. quercicola

PLATE I.

♂ Genitalia of the species of *Phytocoris.*

N. Y. (H. H. Knight). ♂ July 22, 2 ♀ July 25, ♂ July 29, Staten Island, N. Y. (Wm. T. Davis). ♀ Aug. 22, Branford, Ct. (W. H. Winkley). ♂ July 20, ♂ Aug. 1, Boston; ♂ Aug. 6, Riverside; ♂ Aug. 10, Brookline; 2 ♀ Sept. 24, Farmington, Mass. (H. M. Parshley). ♀ July 12, Columbia, Pa. (T. L. Guyton). ♂ July 20, Ann Arbor, Mich.; 2 ♂ Aug. 3, Washington Co., Mich. (R. F. Hussey).

The writer took this species on the bark of Basswood (*Tilia*) but it may well occur on the trunks of other trees. The nymphs of this species as well as the above described forms having a conspurcate membrane, live on tree trunks almost exclusively, thus it would appear that they must be wholly predaceous in their feeding habits.

Explanation of Plate.

(Figures all drawn to the same scale.)

a, left clasper, lateral aspect.
a', left clasper, lateral aspect with outline of genital segment added.
aa, left clasper, dorsal aspect.
b, right clasper, lateral aspect.
b', right clasper, lateral aspect with outline of genital segment added.
c, flagellum.
d, left clasper, caudal aspect.

DORCUS PARALLELUS VAR. COSTATUS.

In "Entomological News," Vol. III, April, 1892, Page 5, concerning the form of *Dorcus parallelus* known as *costatus* Lec., Dr. George Horn says: "*Dorcus costatus* though merely a catalogue name is based on those females in which three of the intervals on each elytron are a little wider and more prominent. . . ."

He makes no mention of the male form of this insect and therefore I think it worthy of note to record that I have lately received from Mr. E. A. Bischoff, an interesting male example of this insect taken by him, labelled New Jersey (probably in the vicinity of Newark, but unfortunately without date of capture)—length of specimen 20 mm.

John W. Angell.

ETHOLOGICAL REMARKS ON SOME NEW ENGLAND WATER-STRIDERS (HEMIPTERA).

By H. M. Parshley, Smith College, Northampton, Mass.

The college pond at Northampton is narrow and winding, perhaps a mile long, formed by a dam thrown across a small and rocky stream. For the most part its insect population is very meager, due no doubt to an extreme lack of aquatic vegetation, but at the upper end, where the stream forms boulder-strewn rapids as it enters the pond, there is a numerous population of aquatic Hemiptera, an association of water-striders which, as I have observed on other occasions as well, seems characteristic of such an environment. Investigating this company of navigators on August 22, 1919, I found the following species represented: of the Gerridæ—*Gerris conformis* Uhl., *Metrobates hesperius* Uhl., *Trepobates pictus* H.-S., and *Rheumatobates rileyi* Bergr.; of the Veliidæ—*Rhagovelia obesa* Uhl.

These species are entirely confined to the surface, except the last mentioned, which dives occasionally; and they are quite independent of aquatic vegetation, since for their prey they depend very largely upon terrestrial insects which chance to fall into the water and are borne down by the current. On the occasion under consideration the individuals of *Gerris conformis* remained for the most part in schools under the shelter of the bank, while those of *Rhagovelia obesa,* nymphs of perhaps the fourth instar, formed a small, compact swarm in the eddy behind a boulder. The other species were to be found scattered more at large over the surface; but farther down, where the water becomes quiet, all were entirely absent. Thus it appears that under certain circumstances these species affect running water by preference, although some of them, members of the Halobatinæ, may often be found on bodies of water quite lacking in current, as stated by de la Torre Bueno.[1] In order to maintain their position near the foot of the rapids, these insects ordinarily row in leisurely fashion against the current, thus exhibiting like many other fluviatile animals what has been called a positive rheotropism, but this habit is by no means the manifestation of a fixed and mechanical reflex, since on occasion they turn and with the same facility move down the stream or across it, in pursuit of prey or away from enemies, or with purposes less clear to the observer.

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[1] Gerrids of the Atlantic States. Trans. Am. Ent. Soc., Vol. 37, 1911, p. 243.

Among these water-striders may be found most striking examples of pterygo-polymorphism, or diverse wing development among individuals of a single species. *Gerris conformis* is always macropterous in this region, while a near relative, *G. remigis* Say, also found as a rule on running water, is usually but not always apterous. Of *G. marginatus* Say, generally macropterous, more rarely apterous, there are often found examples having wings of one half the normal length, as well as various intermediate conditions, and in *G. canaliculatus* Say both macropterous and apterous forms occur frequently, the one sometimes developing from eggs produced by the other, as de la Torre Bueno has shown.[2] *M. hesperius, T. pictus, R. rileyi,* and *R. obesa* are usually found in the apterous condition in the north, but winged individuals of all these species may be occasionally met with. Among thousands of examples of *R. rileyi* recently examined at Cold Spring Harbor, L. I., but one was macropterous, the rest quite apterous. Reuter[3] and de la Torre Bueno[4] have offered speculations, notably lacking in experimental evidence, on the subject, but an adequate explanation of the phenomenon is yet to be made and the problem is certain to repay investigation by modern methods, since even the genetic behavior of the forms, quite possibly Mendelian, is almost entirely unknown. These insects, especially the species of *Gerris,* can be bred successfully in captivity by following the methods developed by de la Torre Bueno.[5]

The occurrence here of the species enumerated above is of some distributional interest, since none of them, excepting *Gerris*

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[2] Op. cit., p. 248.

[3] Polymorphisme des Hémiptères. Bull. Soc. Ent. France, 1875, pp. 225–236.

[4] Life history and habits of the margined water strider, *Gerris marginatus* Say. Ent. News, Vol. 28, 1917, p. 297.

[5] Notes on collecting, preserving and rearing aquatic Hemiptera. Can. Ent., Vol. 37, 1905, pp. 137–142.

conformis, have hitherto been reported from western Massachusetts. *Rheumatobates rileyi,* remarkable for its extreme sexual dimorphism, is a notable addition to the New England fauna, and this is the most northern point in its known distribution, if we except the doubtful Quebec record[6] of an immature example found by de la Torre Bueno among the specimens described as *Halobatopsis béginii* by Ashmead. In response to my request for information regarding the labels attached to these specimens, which are preserved in the National Museum, Mr. Gibson most kindly sent them for examination and I find no reason to suppose that the example of *R. rileyi* came from Canada. One pin holds four nymphs of *Metrobates hesperius,* the other a nymph of the same species and one of *R. rileyi* and both bear hand written labels—"Nj. 27–7–96"—which I take to refer to New Jersey. Another specimen from this series, which I have not seen, bears the label "Sherbrooke, Can.," as described by de la Torre Bueno,[7] but this is *M. hesperius,* and moreover it is only to this that the original description refers or applies. To the immature examples of *M. hesperius* sent from Canada by the Abbé Bégin and described by Ashmead[8] as *Halobatopsis béginii,* it is evident that there have been added, probably by Ashmead himself, other materials from other localities, including the specimen of *R. rileyi,* under the impression, of course, that they were all conspecific. Only the specimen or specimens labeled "Sherbrooke, Can.," can be regarded as type material of Ashmead's unfortunate creation, and hence the citation[9] of *H. béginii* as a synonym (in part) of *R. rileyi* would seem hardly justifiable.

But to return to our association of water-striders. Visiting the rapids again on September 29 with a class, we found three of the species still active, though in reduced numbers, represented by both adults and nymphs, but *Gerris conformis* and *Rhagovelia obesa* had quite disappeared. Very likely these are of more delicate constitution than the others and had been led to seek winter quarters by the recent cold and rainy weather, though the particular day referred to was bright and warm. Next spring we shall try to determine the time at which these species first appear, and then the data of occurrence may be more fully summarized.

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[6] Gerrids of the Atlantic States, *l. c.,* p. 251.

[7] On *Halobatopsis beginii* Ashm. Can. Ent., 1911, Vol. 43, pp. 226–228.

[8] A new water-bug from Canada. Can. Ent., 1897, Vol. 29, p. 56.

[9] Van Duzee's Catalogue, p. 431, doubtless following de la Torre Bueno, *op. cit.,* p. 228.

NOTES ON THE HEIDEMANN COLLECTION OF HETEROPTERA NOW AT CORNELL UNIVERSITY.

By J. R. de la Torre-Bueno, White Plains, N. Y.

While on a visit at Cornell University in the summer of 1919, through the courtesy of Dr. J. C. Bradley, I was able to go over the Heidemann collection of Heteroptera, purchased by the University after his death. These few notes refer to those facts which could be determined without prolonged study and comparisons.

Oncozygia clavicornis Stål. The collection contains two specimens of this very rare species, one from Fortress Monroe, Va., April 19; and the other from Ashby, Fla. The latter is an addition to its distribution, it being known only from Texas and Virginia.

Teleonemia slossoni Heid. Type. The specimen so marked is a short-winged *Alveotingis grossocerata* O. & D., from Franconia, N. H., taken by Mrs. Slosson; 2 short-winged, with perfect antennæ, are from Delaware Water Gap, Pa., Mrs. Slosson, as is one long-winged specimen. The New Hampshire record is new. I have taken this species in White Plains, N. Y. (heretofore unrecorded from the state) and also a macropterous specimen in beach-washup, at Smith's Point, L. I.

Metatropiphorus belfragei Reut. There are specimens in this collection from Biscayne, Fla.; Virginia Beach, Va.; Cabin John, Md., and Anglesea, N. J. All these except Biscayne, are additional localities; Van Duzee reports it only from Florida and Texas.

Carthasis decoratus Uhler. There are two adults and one nymph from Bladensburg, Md., in the collection.

It is to be hoped that this collection may be gone over and straightened out by competent hands some time in the not too far distant future.

A NEW HOST OF LABOULBENIA FORMICARUM THAXTER, WITH REMARKS ON THE FUNGOUS PARASITES OF ANTS.

By J. Bequaert, American Museum of Natural History, New York City.

Among some ants collected last summer near Boston, was found a worker of *Formica pallide-fulva* Latreille subsp. *schaufussi* Mayr, which on examination by Prof. Wheeler proved to be infested with the curious parasitic fungus *Laboulbenia formicarum* Thaxter. This ant was incidentally picked up, running over the sidewalk in Arborway Park, at Forest Hills, Mass. (August 7). I was unable to discover the infested nest or any other specimens carrying the fungus. In addition to the ant here mentioned, the known hosts of this fungus include now such common species as *Lasius niger* (Linné) var. *americanus* Emery, *L. niger* var. *neoniger* Emery, and *Formica subpolita* Mayr var. *neogagates* Emery. But, strange to say, it has been recorded thus far only from the vicinity of Boston, where it is of rather frequent occurrence (Cambridge, Ellisville and Forest Hills). There is apparently no reason why it should not be found in many other localities, when properly looked for.

The scarcity of parasitic fungi on ants is rather surprising and has often been commented upon. It is by no means due to lack of proper investigation; for ants exist everywhere in great abundance and have been intensely studied both in nature and in the cabinet; it would be difficult to name another group of insects of which such large numbers of specimens have been collected and examined. The great rarity of these fungous parasites can, however, be easily accounted for by the proverbial habits of cleanliness characteristic of ants, "which tend to suppress or render impossible the development of the fungi, except under unusual conditions. All ants devote a great deal of time and attention to cleaning their own integument and that of their nestmates. They are, indeed, forever combing and scraping the surfaces of their bodies with their tongues and strigils, so that fungi must find it difficult to gain a precarious foothold in their nests, to say nothing of an opportunity to proliferate" (Wheeler).

Laboulbenia formicarum belongs to the Laboulbeniaceæ, a family usually included among the sac fungi or Ascomycetes and exclusively found growing on living arthropods. Of the 600 or more described species of these fungi, the great majority attack beetles; only the three following have been hitherto recorded from ants. *Rickia Wasmannii* Cavara is the only ant-infesting form known from Europe, where it grows on *Myrmica lævinodis* Nylander and on *M. scabrinodis* Nylander. *Rickia formicicola* Spegazzini, recently described, was found on *Prenolepis silvestrii* Emery, in La Plata, Argentina. The hosts and distribution of *Laboulbenia formicarum* Thaxter have been mentioned above. These ant-inhabiting Laboulbeniaceæ are small and inconspicuous fungi, and when examined *in situ* on the host, appear like minute, usually dark-colored or yellowish bristles or bushy hairs, projecting from its chitinous integument either singly or in pairs, more commonly scattered, but often densely crowded over certain areas on which they form a furry coating; when infestation is excessive, the ants have been properly compared with hedgehogs, fairly bristling with tufts of the fungus (Wheeler). The detailed structure of these fungi can only be studied with a proper magnification, for the ant-attacking species are among the smallest members of the family, rarely exceeding one or two tenths of a millimeter in total length. Perhaps the most remarkable peculiarity of the Laboulbeniaceæ is their ability to thrive freely on their hosts without interfering much with its activity, inflicting little if any appreciable injury. In the case of the ant parasites, the parasitism is purely external, the fungus deriving its nourishment in all probability from the superficial layers of chitin or from deeper lying nutritive elements absorbed, without penetration, through the sucker-like foot.

Of the other fungous parasites of ants, certain Hypocreaceæ (Ascomycetes) of the genus *Cordyceps* are the most noteworthy, being of rather large size and of not unfrequent occurrence. In this case, the polycellular mycelium pervades the tissues of the host, which is rapidly killed, and often produces asexual spores or conidia borne on external hyphæ variously agglutinated or united (*Isaria* stage). The mycelium finally produces outside the body of the insect a boll-shaped or club-like organ or fructification, carried on a stalk sometimes several inches in length. The swollen portion of this external stroma bears numerous ascocarps or perithecia containing the spores, which are formed within elongate cells, the asci. Some hundred spcies of *Cordyceps* are known, all but two or three parasitic upon arthropods; as a rule they are but little particular in the choice of their host, the same species often attacking members of different species, families, or orders.

Ten species of *Cordyceps* have been recorded from ants, as can be seen from the appended bibliography; but most of these were found in the tropics. *Cordyceps unilateralis* (Tulasne), a rather widely distributed parasite of many insects, is the only form mentioned from ants in North America. Thaxter has recorded it incidentally as growing on an ant which was not further specified at the time, but, according to information kindly given to me by Prof. Wheeler, was a *Camponotus herculeanus* (Linné) subsp. *pennsylvanicus* (De Geer) from North Carolina.[1] It has been found on several other ants in South America and the East Indies. The external part of this *Cordyceps* consists of a black, very slender, thread-like stroma, 13 to 20 mm. long and ¼ to ⅓ mm. thick at the base, feebly bent about or above the middle of its length where it bears on one side the perithecia fused into a subglobose head, 1 to 2 mm. in diameter, with rosette-like protuberances.

Cordyceps myrmecophila (Cesati) is a fungus of larger size and has been frequently observed on ants, though it attacks also various other insects. It is known from Europe (Italy, Finland), Brazil and tropical Africa. In the Belgian Congo its host of predilection apparently is the common large ponerine ant, *Paltothyreus tarsatus* (Fabricius). It is by no means rare to find dead specimens of this ant firmly attached with the closed mandibles to a leaf, a grass stalk or a stick, several inches or a few feet above the ground, while a long-stalked *Cordyceps* protrudes from the body. Though this position is often observed in ants that die from fungous diseases, it is nevertheless remarkable in this case, since *Paltothyreus* is a foraging, strictly terrestrial ant, not known normally to climb the vegetation. The stroma of the fungus grows out of the side of the thorax, as a rule between one of the coxal articulations: a slender stalk, 2 cm. or more long, ends in a club-shaped fructification bearing the ascocarps. More rarely two such fructiferous stromata are borne by the same ant.

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[1] Prof. Wheeler also informs me that unidentified *Cordyceps* are in Prof. Thaxter's collection from the following ants: *Camponotus herculeanus* subsp. *pennsylvanicus* var. *novæboracensis* (Fitch) from Maine and *C. abdominalis* (Fabricius) from Trinidad.

A number of so-called "imperfect fungi"—incompletely developed, conidia-bearing or sterile stages of various Ascomycetes—have been recorded from ants. A nest of *Formica rufa* Linné, at Potsdam, Germany, was heavily infested with fungous growths, about the size of a pin-head and attached mainly to the thorax, more rarely to other parts of the body. The ants were apparently but little hampered by their parasites. From cultures obtained with these fungi, Bischoff concluded that they belonged to several species, among them a *Mucor,* a *Penicillium* and a yeast. Thaxter also found in the vicinity of Cambridge, Mass., a fungus forming blackish incrustations on various parts of ants and giving rise to a few short, colorless, erect branches; the exact nature of this plant has not been determined, nor is the name of its host mentioned.

To complete this brief account of the fungous parasites of ants, I must still mention two imperfect fungi described by Prof. Thaxter. One of these, *Desmidiospora myrmecophila* Thaxter, of the family Mucedinaceæ, was growing luxuriantly on a large black ant fastened to the under side of a rotting log in Connecticut. The hyphæ, much branched and septate, covered the host in a white flocculent mass extending a short distance over the substratum. The host of this parasite has recently been identified by Prof. Wheeler as *Camponotus herculeanus* subsp. *pennsylvanicus* (De Geer). Prof. Wheeler further informs me that the same fungus is in Prof. Thaxter's collection from New Hampshire, growing on the same ant and its var. *novæboracensis* (Fitch). Another curious parasite belonging to the Dematiaceæ, *Hormiscium myrmecophilum* Thaxter, was found on various parts of a *Pseudomyrma* collected by W. M. Mann along the Amazon River, Brazil. The majority of the individuals taken from a nest were infected by the fungus, which is sufficiently large to be readily visible as it projects from the surface of the host; it consists of brownish or nearly hyaline, closely septate filaments, about one quarter millimeter long, one to several arising from a deeply blackened foot.

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AN AMERICAN SPECIES OF CYMATIA (CORIXIDÆ, HEMIPTERA).

By Roland F. Hussey, University of Minnesota, Minneapolis.

While collecting waterbugs at a small pond near St. Paul, Minnesota, in the fall of 1918, I observed numerous individuals of a Corixid species which was notably distinct from all the other species of the family with which it was associated. On each of my visits to this pond I found this form to be one of the most abundant waterbugs in the habitat; and in January, 1919, I found large numbers of this species hibernating in groups of from ten to fifty individuals in air-pockets in the ice which covered the pond. This remarkable mode of hibernation is being investigated, and will be discussed in a future paper. The species was much less abundant, however, during the next fall and winter: less than a dozen individuals were found between October, 1919, and January, 1920.

The pond from which these Corixids were taken is small, less than 100 yards in diameter, and not very deep. The bottom is soft and mucky, and there is very little aquatic vegetation, at least in the parts where most of the collecting was done.

I have also found this species among some Corixids from North Dakota, which were sent to me recently from the Museum of Zoölogy of the University of Michigan. These bugs were taken quite fortuitously by Miss Crystal Thompson from among the aquatic vegetation at Fort Totten Lake, while she was making Birge-net collections of Crustacea under the direction of Professor R. T. Young at the North Dakota Biological Station. Through Mr. F. M. Gaige of the University of Michigan Museum, Miss Thompson has kindly furnished me some data concerning the habitat.

Fort Totten Lake is a shallow, weedy body of water, less than a quarter of a mile in diameter, located about a mile and a half from Devil's Lake. It is the only body of fresh water within a radius of five or six miles. The bottom is rather firm and sandy, with considerable debris, and there is a rather plentiful growth of *Chara*, *Ceratophyllum*, etc. The lake has neither inlet nor outlet.

Meanwhile, study of the Minnesota specimens had shown that the Corixid in question was an undescribed species of the genus *Cymatia*—a conclusion which has kindly been verified by my friend Mr. J. R. de la Torre-Bueno.

Cymatia was proposed by Flor in 1860 (Rhynch. Livl., i, pp. 783, 799) as a subgenus of Corixa, to include *Sigara coleoptrata* Fabr. and *Corixa bonsdorffi* C. R. Sahlberg, both of which are widely distributed in the Palæarctic region. Two other species have since been described from the Old World, but until now the genus has not been recorded in America—indeed, the present species is the first one known outside the Palæarctic region. The genus may be characterized as follows.

Head, together with the eyes, broader than the pronotum; eyes more widely removed from the hind margin of the head than in *Corixa, Arctocorisa,* etc. Vertex horizontal, tumidly projecting between the eyes, and forming a sharp angle (best seen from the side) with the frons; vertex with a more or less distinct carina, and with a shallow depression each side behind the middle. Frons slightly concave in males, flat in females. Clypeus smooth. Pronotum broader than long, the anterior half, at least, with a median carina. Scutellum concealed by pronotum. Body broadest behind the middle. *Pala subcylindrical, a little curved inwardly, at least five times as long as it is thick,* 2½ to 3 times as long as the tibia, to which it is closely united; *pala with a single apical spine or claw which is at least one third as long as the pala itself,* and with two rows of very long bristles; *pala without stridular pegs.* Fore femur without stridular area. Asymmetry of abdominal segments of male dextral; strigil absent.

Through the kindness of Mr. Bueno, I have been able to examine specimens of the three European species. I have not seen *Cymatia jaxartensis* Kiritschenko, which was described from Turkestan (Rev. Russe Ent., xi, 1911, p. 92), nor do I have access to its description at present. The four species known to me may be separated as follows:

1. Head shorter than the pronotum, which is about three fourths as long as it is wide; pronotum with fine reticulate markings similar to those of the hemelytra (southeastern Europe) .... *C. rogenhoferi* Fieb.

Head longer than the pronotum, which is not more than one half as long as it is wide; pronotum concolorous..2

2. Head about three times as long as the pronotum, which is four times as wide as it is long; hemelytral markings confluent in longitudinal bands; hind wings absent (all Europe) ....*C. coleoptrata* Fab.

Head very slightly longer than the pronotum, which is about twice as wide as it is long; hemelytral markings not confluent; hind wings present..................3

3. Size smaller, length about 6 mm. (all Europe). *C. bonsdorffi* Sahlbg.

Size larger, length 7.5 to 8.3 mm.; American species (Minnesota and Dakota)..........*C. americana* n. sp.

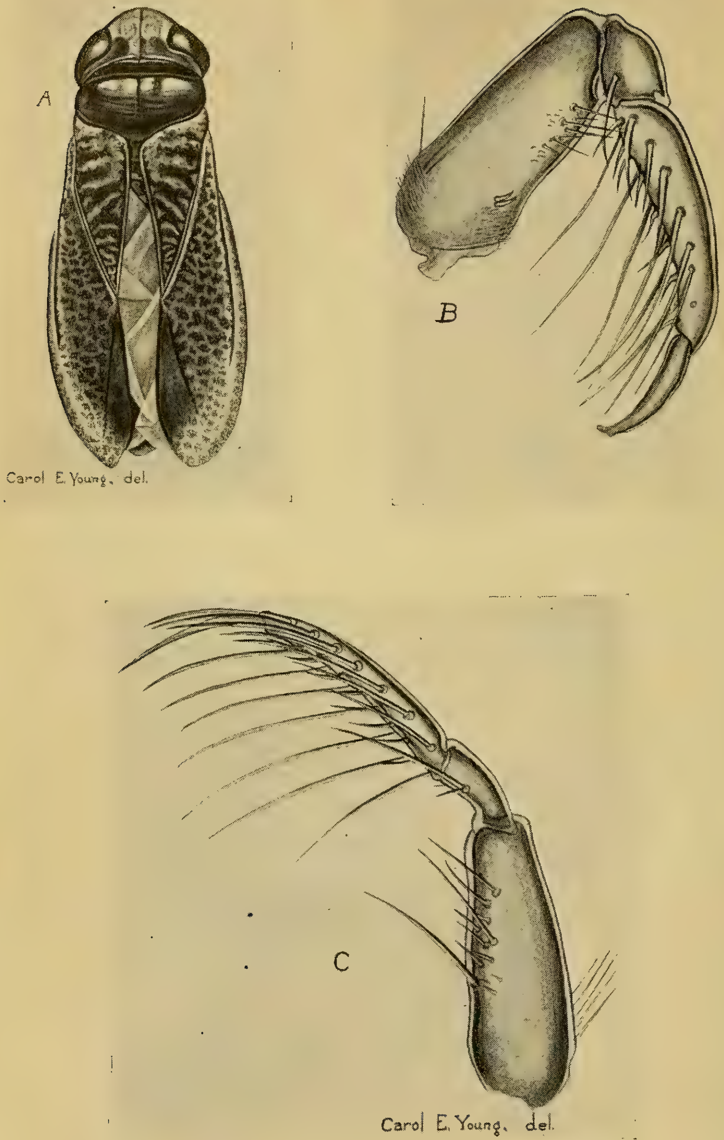
Cymatia americana, n. sp.

Near *C. bonsdorffi* Sahlbg., but differing as stated above. General color above dark olive-green in living individuals, marked with black; in pinned specimens the green rapidly fades to yellowish brown. Length 7.4–8.3 mm.; width of pronotum 2.0–2.5 mm.; width across hemelytra 2.6–3.0 mm.

Head green, broadly infuscated behind, and with two large brown spots on the hind margin of the vertex; head slightly longer than the pronotum and about twice as wide as it is long. Inner margins of the eyes straight, diverging anteriorly; synthlipsis one fifth to one fourth narrower than the anterior margin of the vertex; vertex with several concolorous punctures anteriorly. Front coarsely punctured each side, and with long whitish pubescence which is erect in living specimens.

Pronotum subshining, about twice as wide as it is long, dark olive-green to olive-brown in life, the margin narrowly blackish, the lateral submargin very lightly impressed. Median keel becoming obsolete on the posterior third of the disk; anterior margin of pronotum lightly emarginate, posterior margin very slightly sinuate. Disk of pronotum with several very fine transverse scratch-like impressions, interrupted by the median keel, sometimes absent. Pronotum very minutely rastrate (it requires a compound microscope to resolve the rastrations).

Hemelytra olive-green, marked with black. Clavus rastrate-rugulose, with oblique black lineations which are usually heaviest near its base; the lines somewhat forked and broken, not reaching the inner angle, more irregular and sometimes confluent on the apical part. Corium sparsely and irregularly punctate with black, and with numerous irregular blackish maculæ which are commonly heaviest near the apex of the clavus and which tend to form two or three indefinite longitudinal series. Embolium whitish, externally margined with


A
Carol E. Young, del.
B
C
Carol E. Young, del.

CYMATIA AMERICANA, Hussey

fuscous on the posterior part. Membrane narrow, about five times as long as it is wide, very lightly irrorate with fuscous, marked off from the corium by a black line. Hemelytra nude, without hairs.

Sterna, coxæ, and trochantera fuscous; mesosternal xyphus yellow, infuscated at base; pleura whitish. Legs yellow, tips of middle tarsi and hairs on the hind legs embrowned. Middle tarsus about twice as long as the claws and about one fourth shorter than the tibia. Male abdomen blackish, marked with yellow above. Female abdomen green in life, apical segment brownish.

Male pala as long as the femur, and about 2½ times as long as the tibia; apical claw ligulate, nearly half as long and about half as wide as the pala. *Female pala* three times as long as the tibia; claw slender, finger-like, half as long as the pala. Pala with about seven long bristles on each side, in both sexes.

Holotype and allotype: ♂ and ♀ respectively, collected near St. Paul, Minn., January 15, 1919, in ice (R. F. Hussey); in coll. Museum of Zoölogy, University of Michigan.

Paratypes: 9 ♂♂ and 20 ♀♀, topotypic, Sept. 23 and Oct. 8, 1918, Jan. 15, Nov. 17, and Nov. 24, 1919, Jan. 9 and Jan. 17, 1920. Also 5 ♂♂ and 6 ♀♀, Fort Totten Lake, N. D., Aug. 7, 1919 (C. Thompson). In colls. University of Michigan Museum of Zoölogy, University of Minnesota Division of Entomology, J. R. de la Torre-Bueno, H. B. Hungerford, H. M. Parshley, and R. F. Hussey.

The description given above was drawn up from specimens studied under the binocular microscope, and the comparative measurements were made with an ocular micrometer in one of the eye-pieces.

For the excellent drawings which accompany this paper, I wish to thank Miss Carol Young, art assistant in the Department of Animal Biology of the University of Minnesota.

Explanation of Plate.

A. *Cymatia americana* n. sp., ♀, × 7½.

B and C. Fore legs of male and female respectively, × 31. (Drawn from legs cleared and mounted in balsam.)

EDITORIAL.

THE OLD BULLETIN.

Recently we went over the first seven volumes of this BULLETIN. What a difference! The typography, especially of the early volumes, was most fancy. Somebody did it artistically in archaic style.

But the contents! That is another matter. This BULLETIN was then truly representative of the Society; those that published in it wrote out of the fulness of their hearts. Even their one and two line notes have strength and character. They wrote simply of the things they saw, sometimes with ingenuous and unpracticed hand, revealing their lack of the scholastic attainments of their successors. But the eager, sincere spirit of investigators was there and their writings have the same tense appeal now that they had then. They were pioneers, and they set their souls into clearing the way for those that came after. Their simple words inspire.

Yet, they were practical, and these first seven volumes bear witness to this. What they wrote was to be of use to their fellows and not merely a cold accretion to the sum total of human knowledge. Helpfulness was their keynote, and it dominated all they did. That is why it shall live with their memories long after it has ceased to serve the practical purpose for which it was meant.

Every member of the Society contributed at one time or another, and the BULLETIN *was* the Society.

We, their successors, may well follow their guidance to our own profit.

J. R. T. B.

HEW TO THE LINE, LET THE CHIPS FALL WHERE THEY MAY.

Entomology among ourselves, in these great and glorious United States, seems to partake of the character of a mutual admiration society. There are, of course, a few daring—and unpopular—spirits who utter once in a while the discordant and raucous note of dissidence to disturb the close harmony of the chorus of general praise for everybody's work. A prominent exemplar of these unharmonious spirits is a certain editor-doctor known in Washington, who long ago set forth his unvarnished opinion of a lady's book.

It is truly an invidious task to pick the flaws in the work of estimable gentlemen with whom one has no quarrel, yet the pursuit of science compels one to seek the exact truth, and having approximated it, it should be set forth plainly and without tender leanings toward one's own little foibles or toward the weaker brethren's limitations.

We miss in our entomological magazines the stout swashbuckler, who made no bones of smashing, and sometimes in not too urbane language, the pretty little conceits of his fellows. We are become buggish mollycoddles. We see the other fellow fail to follow the light, and we shrug our shoulders and pass by—perhaps not without some tropistic anticipation that he may fall into the nearest pit. But we haven't the hardihood to push him in; or to stop him forthright in his career. We are too refined.

But we should be ever ready to enlighten, and to correct, and if necessary, to discipline, those who transgress, who fall from entomological grace, so to speak.

In fact, we should do justice though the heavens fall.

J. R. T. B.

NEW NAME FOR NEMOSOMA PUNCTULATA.

I wish to substitute the name of *Nemosoma punctulata* Van Dyke, for *Nemosoma punctatum* Van Dyke, described in Bull. Brook. Ent. Soc., Vol. XI, p. 71 (1916), because *punctatum* is preoccupied, having been used by Leveille in Anns. Soc. Ent. Fr., vol. X, 1888, p. 411 (appeared 1889), for a Brazilian species.

Edwin C. Van Dyke.

BOOK NOTES.

A Source Book of Biological Nature Study, by Elliott R. Downing. (University of Chicago Press, $3; postpaid, $3.20.)

A Field and Laboratory Guide in Biological Nature Study, by Elliott R. Downing. (University of Chicago Press, $1; postpaid, $1.15.)

The nature student of today, young or old, frequently becomes the scientific worker of later years. This is a truism. It would seem the duty of every biologist to encourage the love of nature, not entirely from altruistic motives—for biologists are human—but each with the thought in mind that some one of these nature-lovers may gravitate to his own specialty.

With us, in this country, one of the helps the Europeans have is wanting. We have not, for instance, the many comprehensive books they have heretofore rejoiced in, interestingly written, attractively brought out, and at a low price. This condition is being gradually met, and in time will doubtless be overcome entirely.

Meantime, entomologists, as well as other biologists, will always be asked for the name of some general book on outdoor life, suitable for the non-technical reader, yet not of the popular cream-puff variety of literature.

This want is met by Dr. Downing's books. In the first, we have quite full accounts of the animals of pond and stream, insects and their allies, which fills nearly 100 pages; birds and animal companions; and five chapters on plant life. One very fine feature is the extensive bibliographies added to each chapter, that on insects alone embracing 73 titles. To entomologists, naturally, the chapters on insects are of chief interest. The chapter on pond and stream animals includes also a number of insects, mainly larvæ of various orders. Some of the figures of these are impressionistic to a degree, and that of a waterboatman (*Corixa*) in Fig. 19, is quite impossible. This is an exception, however, the other cuts being either from original photographs, or good figures from other sources.

As a whole, this "Source Book" is informative and interestingly written. It is also quite useful in a general way in groups not specialized in, and well worth while as a general nature book. The amateur entomologist will find it excellent to get a line on the things he sees afield which are not known or familiar to him.

With this work goes the Field Guide, an excellently arranged skeleton to develope the powers of observation and to systematize them. It goes to nature for its facts and furnishes a general outline of a method for getting at them.

J. R. T. B.

PROCEEDINGS OF SOCIETY.

Annual Meeting, January 15, 1920.—Officers for 1920 were elected as follows: Mr. Wm. T. Davis, President; Mr. J. R. de la Torre-Bueno, Vice-President; Dr. J. Bequaert, Corresponding and Recording Secretary; Mr. R. R. McElvare, Treasurer; Mr. A. C. Weeks, Librarian; Mr. G. Franck, Curator; Mr. H. Notman, Delegate to Council of New York Academy of Sciences; Messrs. J. R. de la Torre-Bueno, G. P. Engelhardt, and J. Bequaert, Publication Committee.

Messrs. E. F. McDevitt and Wm. Murphy, both of Brooklyn, were elected to membership.

Scientific Programme: Dr. J. Bequaert presented an account of his entomological experiences in the Belgian Congo, illustrated with lantern slides.

Meeting of February 12, 1920.—*Scientific Programme:* Mr. A. C. Weeks read a paper on "Movements and Migrations of Insects," discussed by the members present.

Mr. Wm. T. Davis showed a male earwig, *Doru lineare* (Eschscholtz), found on Staten Island in spinach, February 4, 1920. He stated that at this season of the year many insects are imported from the south in green vegetables. He exhibited the earwig, *Labidura bidens* (Olivier), found in a head of lettuce on Staten Island, January, 1916; and two females *Neoconocephalus triops* (Thunberg), one of which came from Middletown, Orange Co., N. J., March, 1919, and the other from a head of lettuce, Newark, N. J., March, 1917; this last was received from Mr. Wm. P. Comstock.

Meeting of March 11, 1920.—*Local Records:* Mr. Bueno read a newspaper extract recording damage done in this vicinity by termites or white ants and comments thereon; this is discussed by Messrs. Davis and Schaeffer. Mr. Wm. T. Davis showed *Pœctes pygmæa* Hübnr. collected at Lakehurst, N. J., June 1, 1918; this moth has been reported from the southern States, and this is the first New Jersey record.

Scientific Programme: Dr. J. Bequaert reviewed F. X. Williams' "Studies on Philippine Wasps," recently published.

Mr. Doll exhibited interesting butterflies from Texas; also the following moths from New Mexico: *Arachnis zuni* Neumoegen, *Hyperchiria zephyria* Grote, and *Coloradia pandora* Blake. Mr. Engelhardt showed a number of interesting moths from New Hampshire, including *Heliotropha obtusa* Smith, *Cossus centerensis* Lintner, and *Panthea acronyctoides* Walker.

J. Bequaert, *Secy.*

ON RHAMPHOCORIXA BALANODIS ABBOTT.

By J. R. de la Torre-Bueno, White Plains, N. Y.

Rhamphocorixa balanodis Abbott was described from Missouri in 1912,[1] at which time the author erected for it that new genus. Subsequently, he wrote me saying he suspected it might be one of Uhler's species, *acuminata*, described in 1897,[2] from Illinois and Texas. To satisfy myself, this was checked up with Uhler's description cited, and the species was found to agree perfectly with it.

The synonymy becomes *Rhamphocorixa acuminata* Uhler 1897 (Corixa)-*balanodis* Abbott 1912.

To the localities of these two authors would be added the following: Washington, D. C. (Coll. Heidemann); Plano, Texas, "at trap light" (E. S. Tucker); Normal, Ills. (U. S. N. M., "coll. C. V. R." labelled "*Corixa scutellata*").

[1] Can. Ent., XLIV: 118.

[2] Tr. Md. Ac. Sci., I: 392.

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BULLETIN
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VOL. XV OCTOBER, 1920 NO. 4

THE RESPIRATION OF AQUATIC INSECTS.

A Collective Review.

BY RICHARD A. MUTTKOWSKI, PH.D., University of Idaho.

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1. *Introductory.*

The present paper constitutes a collective review of work of the past fifteen years on the respiration of aquatic insects. Among the more important workers in this field the following may be named: Brocher, Portier (France); Böving, Blunck, Krogh, Wesenberg-Lund (Denmark); Ege (Sweden); Franckenberg (Germany); Tillyard (Australia).

When we speak of aquatic insects, we usually mean that the particular insects are aquatic in their larval stages—hence that they lead an *amphibious* life, aquatic in the larval stage, terrestrial in the adult state. An absolute division cannot be made, as insects possess varying degrees of aquaticity. The distribution of aquatic life among the orders is as follows:

Orders entirely amphibious: Odonata, Perloidea, Ephemeroidea, Trichoptera.

Orders in part amphibious:

- Coleoptera: Parnidæ, Haliplidæ, Gyrinidæ, Hydrophilidæ, Dytiscidæ, Galerucinæ, etc.
- Diptera: Psychodidæ, Corethridæ, Chironomidæ, Culicidæ, Stratiomyidæ, Tipulidæ, Simuliidæ, Dixiidæ, in part or wholly, etc.
- Hemiptera: Corixidæ, Belostomatidæ, Naucoridæ, Notonectidæ, etc.
- Hymenoptera: some parasites (some Trichogrammatidæ, etc.).
- Lepidoptera: Nymphalinæ, some Noctuid genera.
- Megaloptera: Sialidæ, *Corydalis*.
- Neuroptera: Hemerobidæ.

It should be noted that the amphibious habit is not confined to a few orders, but that it may occur anywhere. It may be that the entire family leads an amphibious life, or that a single genus of a family is amphibious. Thus, among the Ceratopogonidæ, one section is completely terrestrial in habit, while the remainder is amphibious; among the Chrysomelidæ, the subfamily Galerucinæ is aquatic, the remainder terrestrial. Again, among aquatic Coleoptera we find nearly uniformly that the adults also are amphibious, while in all other orders the adults spend their lives above water, although a number of genera are known in which the adult enters the water for prolonged period for oviposition (*Enallagma* and *Aeschna* among Odonata, many Trichoptera, especialy micro-Trichoptera, for periods from one half to six hours).

Two terms used frequently in this paper will need definition: *surface-breathers* and *water-breathers*. By *surface-breathers* such animals are designated as come to the surface of the water to renew their oxygen,—that is, they breathe atmospheric air. *Water-breathers* are all animals that obtain their oxygen in solution directly from the water. The dividing line between these two categories cannot be as sharply drawn as one might suppose, for the degree of aquaticity is variable. For instance, as will be shown later, surface-breathers may become temporary water-breathers.

Among water-breathers two types of breathing exist: an *internal oxygenation, i.e.,* the oxygen exchange takes place within the body (*e.g.,* Odonata larvæ, Chironomid larvæ) ; and *external oxygenation, i.e.,* the oxygen exchange takes place outside of the body (*e.g.,* adult beetles).

2. *General Physiology of Respiration.*

The principle involved is that of a diffusion of gases through a moist membrane. We all know that obeying the laws of gas diffusion gases will tend to form an equilibrium on both sides of a moist membrane; or, if in solution, on both sides of a membrane separating two liquids. Such is, simply put, the condition in an aquatic insect. There is a certain gas pressure in the body of the insect; the water around the insect contains gas in solution; a membrane, the cuticle plus hypodermis, separates the two, and throughout the membrane the gases tend to equilibrate.

In aërial respiration of insects the dry atmospheric air is led by the tracheæ and tracheoles directly to the cells where it passes into solution in the cell cytoplasm. The process is assisted by inspiratory movements of abdomen and thorax and by the closing mechanism of the spiracles. Fundamentally, however, the principle of respiration in aquatic insects is that of a gas balance of two sides of a membrane. This has been definitely called a *diffusion* theory in contradistinction to the older *secretion* theory.

3. *Internal Oxygenation.*

By internal oxygenation is meant that the oxygen renewal takes place within the body, or at least at the surface of a membrane,—much as in our own lungs, or as in the gills of fish. There are two methods found in insects. Briefly, these may be called the *tracheal,* or *gaseous* method, and the *fixation,* or *solution* method. In the *tracheal* method the oxygen goes out of solution at once and is carried to the tissues in gaseous form by the tracheoles. In the *fixation* process the oxygen passes through a membrane and is fixed by a respiratory pigment in the blood plasma, and passes out of solution later on.

The tracheal method has been studied very extensively among insects, and primarily in the Odonata. In several excellent papers Tillyard has taken up the Odonate respiration in a very thorough manner, particularly that of the lantern type of rectal gills found in dragonfly larvæ (suborder Anisoptera). Damselfly larvæ, of the suborder Zygoptera, breathe by means of caudal leaf-like gills.

In gross structure, the morphology of the rectal gills has been likened to a Japanese lantern, that is, the gill lamellæ are arranged in six rows. These six rows are possessed by all Anisopteran larvæ, but modified in several ways. Thus there may be six rows of simple lamellæ, or six rows of double lamellæ. There is another classification into undulate, implicable, foliate and other types of gill lamellæ, depending on the species. For further details I must refer to the papers of Tillyard listed in the bibliography.

Histologically, the structure of one of the gill lamellæ is as follows: The lamellæ are supplied with tracheal trunks, from which short branches supplied with many tracheolar loops extend into the lamellæ, *i.e.*, afferent and efferent capillaries, similar to the blood capillaries of the gills in fish. In cross section each plate is seen to be a lamella, each side one layer in thickness, with a very thin outer cuticle. The cell layer is a modification of the rectal epithelium and forms a syncitium in which the tracheoles are imbedded. The tracheal capillaries lead back to the collecting tracheæ, these to the tracheal trunks which carry the oxygen to all parts of the body, there to be taken up by the smaller vessels and to the tissue cells. The number of tracheolar loops in such a rectal gill has been estimated as varying from 10,000 to 90,000, according to the type of gill possessed by the respective species.

As the gas is used up in the tracheæ there is a diffusion from the region of higher partial pressure outside (in the water) to the region of lower partial pressure within, the gas going out of solution at once in the lumina of the tracheoles. The motion of the rectal gills is to supply a fresh current of water. The composition of the air in the tracheæ is the same as in the water, that is, in the proportions of 65 parts nitrogen to 35 oxygen, as compared to the atmospheric 80 parts nitrogen to 20 oxygen. (This is at zero temperature. The amount of oxygen in solution varies with the temperature of the water, being greatest at zero.) The latter composition has been determined with an apparatus devised by Krogh which is able to measure extremely minute quantities of the gases.

Since very little nitrogen is used up there is a constant nitrogen equilibrium, while a continuous flow of oxygen takes place. The same is true for carbon dioxide, since there is already an overbalance in the blood in the form of carbonic acid.

The topic of gases entering in solution raises the question: how do gases leave aquatic larvæ? (See section 9 for expiration of adults.) In aquatic insects there is only an afferent stream of gas through the tracheæ to the tissues. Oxygen flows to the cells and is used up in oxidation, and carbon dioxide is formed. What becomes of the carbon dioxide? We know that it is taken up by the blood. But how does it leave the body? The hypothesis was suggested by Tillyard that it probably would go out through thin places in the epidermis in the form of carbonic acid. Personally I was able to show that this hypothesis might apply. In some experiments on the permeability of chitin membranes I was able to show that not only thin portions, but also thick portions of a chitin membrane will very readily permit the passage of carbonic acid in practically all parts of the body. What I did not show was that this passage actually takes place in the living insect. But if a stripped chitin membrane shows such a considerable degree of permeability to the flow of carbonic acid, it can be assumed that it may show a similar degree of permeability in the living aquatic insect. It would then once more be a question of simple diffusion.

In the Zygoptera we meet with a somewhat different type of structure. There are three caudal gill plates, each supplied with tracheal trunks, the middle one with four, the lateral one with two each. As the tracheæ are often pigmented and as their type of branching is distinctive of the species they are used as taxonomic characters. Histologically, a cross section shows the outer cuticle, hypodermis, the two or four tracheal trunks lying in a network of alveoli, and a dorsal and ventral blood channel. The alveoli appear to be derived from the hypodermis, and form ingrowths filling the gills with a meshwork. Their function is obscure. The tracheal trunks break up into smaller trunks, and these into tracheoles, which then form an anastomosing network, not simple and numerous loops in lamellar form as in the Anisoptera, but a fairly elaborate series of anastomosing loops.

The difference between Anisoptera and Zygoptera is then that in the latter the oxygen must pass through a thick outer cuticle, the cellular hypodermis beneath, then to be taken up the tracheal capillaries which lie in the alveolar meshwork. It will be seen at once that the Anisopteran system is highly specialized compared to that of the Zygoptera. In the Zygoptera, however, the capillarization of the caudal gills appears to be not the only source of oxygenation. In experimenting on the necessity of the caudal gills to the life of damselfly larvæ I removed the caudal gills (there is a special breaking point at the base of each gill) in successive instars; while there was regeneration following each amputation, this took place only during ecdysis, and the newly formed gills were at once removed. The presence of a breaking joint in itself indicates that the organism can exist without the caudal gills, while the very copious sternal capillarization of the abdominal segments may be quite efficient in supplying the respiratory wants of the animal in the absence of the gills.

Among insects the respiration of Anisopteran Odonata is unique; and while the principles derived from its study apply generally, yet the strutcures of other insects are rather more like those of Zygoptera. Thus, may-flies and stone-flies have both lateral and caudal gills with a tracheal capillarization much like that of the Zygoptera. There is also the point that in aquatic insects so much of the structure cannot be understood unless one enters into a discussion of the phylogeny. For this there is no place in this paper. Yet the following may be noted: We have what we may call primarily amphibious groups such as stone-flies, may-flies and Odonata, and secondarily amphibious groups which include other aquatic forms. That is, the first have retained their original amphibious habits as indicated by fossils back to carboniferous times, while the others became terrestrial and then secondarily aquatic. Among the latter are to be included the Trichoptera, Coleoptera, Diptera, and Hemiptera.

Fixation Method.—Another method of internal oxygenation is that of fixation of oxygen by some carrier in the blood. In a few rare cases the carrier is colored. Thus, in some species of

Chironomidæ, the pigment is hemoglobin, like that of vertebrates, except that it is found in the plasma, and nót within the corpuscles. The morphology of the blood gills is extremely simple. The gills consist of sacs everted from the body. They have a very thin cuticle, and a hypodermis, and their lumen is continuous with the hæmocoel, so that blood can freely flow into the sacs and out again. The oxygen diffuses through the epidermis just as in the case of vertebrates and is fixed by the hemoglobin or other carrier (perhaps hemocyanin?) in the blood. Just what this other carrier may be is not definitely ascertained. But by far the larger number of aquatic insects have no visible colored carrier or respiratory pigment. Thus, for example, Trichoptera larvæ, the larvæ of *Simulium,* of Culicidæ, and of most Chironomidæ, have gill pouches, usually placed at the caudal end, but all without any visible indication of a respiratory pigment. There is need of more work on this phase of the subject.

4. *Transportation of Air to the Tissues.*

The question of how air is taken up by the cells is still in doubt. Portier claims that the tracheoles end blindly in the individual cells, according to observations made with polarized light. Then there is the older claim that they end blindly at the cell walls, and there is the newer supposition that the tracheoles form capillary loops similar to those at which oxygen enters in the gill lamellæ and also similar to the capillaries of the vertebrates, and that the oxygen passes very readily out through the capillary wall and cell membrane wherever needed. All three theories remain to be proven. But the general cycle of air absorption and transportation can be outlined readily. There are several types of cycles.

a. Atmospheric air—enters tracheæ and tracheoles—passes into solution in cell cytoplasm (all terrestrial insects, all surface-breathers).

b. Atmospheric air—passes into solution in water—passes through membrane and tracheal wall—goes out of solution in lumina of tracheæ—passes into solution in cell cytoplasm. Hence twice in gaseous form and twice in solution till used. (All water-breathing hemimetabola, all Trichoptera larvæ and pupæ, all water-breathing beetle larvæ, all water-breathing Chironomidæ, Corethridæ, and Psychodidæ, etc.)

c. Atmospheric air—goes into solution in water—passes through membrane—is fixed by blood—passes through tracheal walls—out of solution in lumina of tracheæ—into solution in cell cytoplasm. (All holaquatic Diptera, and probably Trichoptera.)

d. Atmospheric air—goes into solution in water—passes through body wall—is fixed by blood—carried by blood to tissues —out of solution in cell cytoplasm. (? Some Chironomidæ larvæ. Hydrachnida ?.)

We have here a progressive order of complexity, wherein the tracheal method tends to persist, but is finally dropped. Many Chironomidæ that have the fixation method well developed also show an elaborate tracheation. Others again show mere vestiges of tracheæ. In the latter it seems rather probable that the respiration is similar to that of other non-tracheate Arthropoda, *i.e.*, the tissues are bathed directly by the blood and the tissues extract their oxygen supply from the blood as they need it. Still more confusing is the fact that in so many Chironomidæ without tracheæ, or only with vestigies, there is no visible carrier.

As an appendix to this section I would note certain filamentous structures which do not contain tracheæ, but which seem to act as respiratory organs and which connect up with tracheæ. Such are the gill filaments in the larvæ of the water-penny *Psephenus*, in caddisworms, the dorsal tufts in the pupæ of *Simulium* and Psychodidæ.

(*Continued in December* BULLETIN.)

DISTRIBUTIONAL NOTE ON TWO SPECIES OF COLEOPTERA.

BY H. M. PARSHLEY, Smith College, Northampton, Mass.

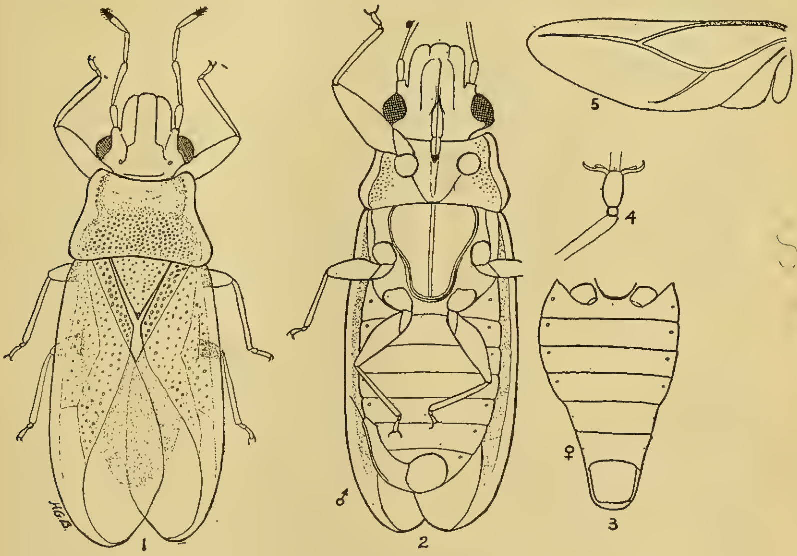
In view of the forthcoming Catalogue of North American Coleoptera in preparation by Leng, I would place on record the following data.

Hololepta æqualis Say. (Histeridæ).

In his excellent treatment of the American Hololeptinæ, my friend Carnochan records *H. æqualis* (*fossularis*) from "New York to Michigan and Eastern Kansas," etc. There are, I believe, in the collection of the Boston Society of Natural History one or two ancient specimens which may have been collected in New England, but these records were considered doubtful by Carnochan, and hence not included in his paper. On April 30, 1920, at Northampton, Mass., I found three specimens of this species, including both sexes, under the bark of *Ulmus americana* logs, thus proving that it does occur within the limits of New England.

Nicagus obscurus Lec. (Lucanidæ).

On May 16, 1919, we met with this rather rare species in numbers on the but recently flooded sandy beaches of the Connecticut River at Hadley, Mass. Specimens were taken in flight, on the sand, and under drift.



Xylastodoris luteolus Barb. (Original drawing by H. G. Barber.)

A NEW MEMBER OF THE FAMILY THAUMASTOCORIDÆ.

By H. G. Barber, Roselle Park, N. J.

Kirkaldy, 1907,[1] established the new subfamily Thaumastocorinæ of the family Lygæidæ "on a single carded specimen" of *Thausmastocoris australicus,* new genus and species, from Queensland, Australia. His subfamily characterization based upon the "structure of the head, labium, legs, etc.," was very meager. Dr. Bergroth, 1909,[2] in describing from Tasmania a new genus and species, *Baclozygum depressum,* assembles the chief characters from Kirkaldy's generic description of *Thaumastocoris* combining these with the characters of his *Baclozygum* to formulate a more definite demarcation of the subfamily Thaumastocorinæ. It is important to note in the words of this author that his diagnosis of the subfamily "so far as the abdomen is concerned is founded on the genus *Baclozygum* since Kirkaldy was unable to examine the single gummed example of *Thaumastocoris* and he tells me the specimen was lost in the drawing."

Dr. Bergroth's characterization of this subfamily in Latin may be translated as follows:

> "Jugæ much longer than the non-sulcate tylus. Rostrum not reaching posterior margin of the prosternum. Clavus towards apex distinctly ampliated, commissure at least equally as long as the scutellum. Membrane without veins. Anterior legs inserted in the middle of the disk of the prosternum, acetabulæ closed up. Apex of the tibia between the two segmented tarsi furnished with a membranous lobuliform caducous appendage somewhat distant from the tarsi. Venter of male furnished with eight visible segments (besides the genital), the last two segments and the genital one asymmetrical, apex of this on the left side (right seen from below) sinuate, the latter [genital] obliquely suboval, genital aperture situated on the right side. Venter of the female furnished with seven visible segments, seventh segment large covering genital segment below. (Otherwise as in subfamily Geocorinæ. Spiracles not investigated.)"

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[1] Proc. Linn. Soc. New South Wales, XXXII, 777. Plate XLIII, figs. 1, 2, 3, 1907.

[2] Deutsche Entomol. Zeitschr., 331, 1909.

Of these diagnostic characteristics Bergroth in a later note places particular emphasis on the following: structure of the tarsi, venter of the abdomen and the membranous tibial appendages.

Dr. Reuter, 1912,[3] raises this subfamily to distinct family rank, making it even the basis of a new phalanx and agreeing with Dr. Bergroth that it represents a very old and primitive group, geologically. In his arrangement of the families Reuter, following Bergroth, gives the distinctive characters which translated read as follows:

> "Claws destitute of arolia. Apex of tibia between the two-segmented tarsi furnished with a membranous lobuliform caducous appendage, somewhat distant from the tarsi. Membrane without nervures. Venter of the male furnished with eight visible segments (besides the genital), the last two ventrally and the genital asymmetrical; female furnished with seven visible segments, seventh large covering the genital segment below."

It is quite natural that Reuter who has made such extensive use of the arolia in his system of classification of the Miridæ should see special significance in their absence in this group and make this a character of the first importance coupled with the peculiar tibial appendage. The peculiar formation of the abdomen is placed secondary.

Up to the present time, so far as I have been able to find, our knowledge of this family has been limited to these two genera each represented by a single species from the Australian region.

Some months ago I received for investigation from Mr. Harold Morrison of the U. S. Bureau of Entomology a number of specimens from Cuba representing a distinct genus which owing to its close resemblance in most particulars to Kirkaldy's *Thaumastocoris* must belong to this family. In order however to admit the inclusion of this interesting little species in this family it will be necessary to create for it a new subfamily and revise the characterization of the family, as this Cuban species has arolia present on the tarsal claws and the tibiæ lack apical membranous appendages.

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[3] Öfv. Finska Vet. Soc. Förh., LIV, 10, 29–31, 58. 1912.

Xylastodorinæ, new subfamily.

Tylus extended to apex of the head, as long as the jugæ, these parallel sided. Rostrum apparently three-segmented (base hidden). Bucculæ represented by low, widely separated ridges as in *Thaumastocoris.* Lateral margins of the pronotum and corium expanded. Corium much wider than abdomen. Clavus parallel sided, not ampliated apically. Commissure much shorter than scutellum. Membrane without veins. Meso- and metasternum fused (composite) and covered by a subcordate plate which is linearly grooved in the middle. Globular coxæ widely separated. Acetabulæ closed up. Odoriferous orifices absent. Seven pairs of ventral spiracles in the male. Tibia without apical membranous appendage. Two-segmented tarsi with arolia set closely to the widely divaricate, decurved claws. Apex of tarsi between the claws with two nearly parallel, porrect setæ. Venter of the two sexes apparently much as in Thaumastocorinæ, first segment however not linear, and the genital apparatus of the male more elongate (Figs. 2 and 3).

Xylastodoris, new genus.

Much flattened. Head porrect, nearly as wide as long; tylus and jugæ equally long, parallel sided. Four segmented antennæ short, less than twice as long as the pronotum, set upon antenniferous tubercles placed between the eyes and lateral margin of head, these entirely visible from above and subtruncated at apex. Margins of head before these, parallel sided to the rounded apex. Eyes well removed from anterior angles of pronotum, posterior to which the head is suddenly contracted. Ocelli widely separated. Bucculæ represented by two widely separated slightly raised ridges evanescent posteriorly. Rostrum short, flattened, apparently of three segments (base hidden), its apex not reaching middle of prosternum; piercing lancets arising before the origin of the rostrum. Pronotum wider than long, about as long as the head, lateral margins considerably expanded and slightly raised; disk flattened, shallowly transversely depressed just before middle; posterior lobe rather coarsely and closely punctate. Scutellum a little shorter than pronotum, a little longer than wide, finely punctate, non-carinate. Hemielytra much wider and longer than abdomen, consisting of clavus, corium and membrane. Lateral margin of corium rather widely expanded and slightly reflexed; disk slightly convex, shallowly punctate; outer apical angle narrowly, crescentically extended to apex of membrane. Clavus parallel sided, irregularly punctate. Membrane well extended beyond abdomen, without veins. True wings composed of a few simple veins, without a hamus (Fig. 5). Meso- and metasternum fused, disk covered by a smooth subcordate shaped plate, the edge of which is narrowly elevated, linearly impressed down the middle. Odoriferous orifices absent. Legs short; globular coxæ widely separated. Femora slightly thickened and flattened, unarmed. Tarsi two-segmented, furnished with two widely separated decurved claws and arolia placed close to the claws (see Fig. 4). Abdomen of the male consisting of eight segments besides the genital, the last two and the genital asymmetrical; the eighth segment is slightly transverse and closely fused to the genital apparatus which consists of a flattened elongated sheath, tapering gradually to a more narrow obliquely truncate apex which is turned forward along either the right or left side of the body. The female has seven ventral segments, the genital segment covered below by the plate like seventh; fourth segment posteriorly and the 5th and 6th compressed; abdomen somewhat asymmetrical posteriorly. Male with seven pairs of spiracles placed ventrally.

X. luteolus n. sp.—Pale luteous. Apex of scutellum, apical half of terminal segment of antennæ and apex of rostrum infuscated. Eyes reddish brown. Form rather narrow oval, much flattened. Head only a little wider than long; porrect; obscurely punctate and faintly wrinkled; suddenly contracted back of eyes which are not in contact with anterior angles of pronotum. Ocelli concolorous, space between these a little over twice the distance to the eyes. Antennæ with short basal segment not attaining apex of head, second segment about twice the length of first, third segment a little more slender, subequal to second, fourth narrow spindle-form, nearly as long as third, apical half infuscated and finely pubescent. Rostrum short, apparently of three flattened segments (base hidden), infuscated apex reaching only a little beyond anterior margin of prosternum, the latter grooved to receive it. Bucculæ represented by two widely separated ridges. Pronotum slightly transverse, obscurely divided into two lobes, posterior lobe rather closely punctate; anterior and posterior margins concavely arcuated, the former nearly straight in the middle; transparent lateral margins strongly expanded and slightly reflexed, edge slightly concave near the middle. Scutellum almost equilateral, faintly punctate. Semi-transpartent hemielytra with lateral margins widely expanded and slightly reflexed, longer than the abdomen. Clavus parallel sided, irregularly punctate. Commissure about one third the length of the scutellum. Corium sparsely, shallowly punctate, with faint indications of veins. Membrane decolorous, transparent. Ventral parts pale luteous. Prosternum transverse, posterior margin more strongly concave than the anterior margin; median longitudinal groove not quite reaching the posterior margin. Propleuræ punctate.

Length 2–2½ mm.

For other characters see generic description and figures.

Type and paratypes in the U. S. N. M. (no. 23641); paratypes in the Coll. of the Tropical Insect Survey in charge of Mr. Harold Morrison and in my collection.

Described from numerous examples from Santiago de las Vegas, Cuba, May, 1918, sent to Mr. Harold Morrison of the U. S. Bureau of Entomology by Dr. Mario Calvino, Director Estación Experimental Agronómica de Cuba. Dr. Calvino states that these were collected from the Royal Palm (Oreadoxa regia) on the young growth of which they are doing serious damage.

The revised family and the subfamily characters may be summarized as follows:

Family—THAUMASTOCORIDÆ.

Tarsi two-segmented, first segment minute. Apex of tibia with or without a lobular membranous caducous appendage; if the latter then are the tarsal claws furnished with arolia. Coxæ globular, widely separated; acetabulæ closed up. Rostrum short apparently three-segmented. Venter of the male posteriorly asymmetrical consisting of eight segments besides the genital; genital segment obliquely antrorse along either the right or left side of venter. Venter of female with the seventh segment covering the genital. Spiracles situated ventrally (?). Odoriferous orifices invisible. Membrane without veins.

Subfamily I. *THAUMASTOCORINÆ.*

Apex of tibia provided with a lobular membranous caducous appendage. Tarsal claws devoid of arolia. Jugæ much longer than tylus. Clavus ampliated apically. Commissure about as long as the scutellum (*Thaumastocoris australicus* Kirkaldy and *Baclozygum depressum* Bergroth).

Subfamily II. *XYLASTODORINÆ.*

Apex of tibia without membranous apical appendage. Tarsal claws provided with arolia. Jugæ and tylus equally long. Clavus parallel sided. Commissure much shorter than scutellum. Hemielytra much wider than abdomen. Venter of the male and female as previously described. (Type—*Xylastodoris luteolus* n. sp.)

Reuter in his "Bemerkungen über mein neues Heteropterensystem"[4] places the Thaumastocoridæ in the series Onychiophora along with the families Pyrrhocoridæ, Lygæidæ, Colobathristidæ and Neididæ. The characters previously fixed by Reuter[5] for this series were later[6] modified by him to include the Thaumastocoridæ. The discovery now of this new member modifies Reuter's system not only so far as the characterization of the family is concerned but if it is to be retained in its original place in his system, at least two further important modifications must be made in the original definition of the Series Onychiopora. In my new genus *Xylastodoris* the meso- and metasternum are composite and the rostrum, although difficult to see because of the nature of its concealment at base, has apparently but three segments.

There is no doubt that this new member serves to further demonstrate the primitiveness of the family. And yet if *Xylastodoris* is compared with the typically primitive characters of a heteropteron as outlined by Reuter[7] there is a noticeable occurrence of less primitive features. Thus following the system of this eminent authority among the structural characters which denote its primitiveness may be mentioned the following: presence of ocelli, four-segmented antennæ, hemielytra composed of corium, clavus and membrane, composite meso- and metasternum, homomorphous pairs of legs, abdomen composed of seven or eight segments which are posteriorly asymmetrical (at least in the male), abdominal spiracles [all or] segments 2–7 ventral. Its structural characters which indicate a modification tending

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[4] Öfversigt Finska Vet. Soc. Förh., LIV, 49, 1912.

[5] Acta Soc. Sci. Fenn., XXXVII, 75, 1910.

[6] Op. cit., 31, 1912.

[7] Op. cit., 37, 1910.

towards greater specialization are in the main as follows: reduction in the number of segments of the rostrum to three, membrane without nerves, metasternum without odoriferous orifices, hind coxæ of the trochalopodous type, two segmented tarsi, claws with arolia. From the foregoing it is extremely difficult to trace the phylogeny of this group but it probably is a relic of a Proto-Lygæid stem. On the whole but particularly because of the presence of arolia and the structure of the head *Xylastodoris* seems to me less primitive than the other two genera.

The external genital armature of the male is to me the most remarkable peculiarity of this genus as nothing at all resembling it occurs in the Hemiptera, outside of this family. The identity of the respective sexes has in fact given me considerable trouble, and the subject is by no means entirely clear to me yet. In fixing the sexes I have been obliged to depend upon the remarks of Dr. Bergroth as my guide and yet this reliable authority unfortunately fails to indicate his reasons for the demarcation of the sexes. Judging from the external appearance of the venter I should have reversed the sexes for what is indicated as the male (Sec. Bergroth) appears to me to be the female with an asymmetrical ovipositor and the ventral aspect of the female (Sec. Bergroth) resembles the terminal ending in the male of several families where the genitalia are covered below. Furthermore it is rather peculiar that the male abdomen is wider than the female one.

Note: It may be worth while to remark that the investigation and original drawings by the author have been made with a No. 4 ocular and an A–2 objective of a Zeiss binocular.

Fig. 1. Dorsal view of ♂ *Xylastodoris luteolus* n. sp.
Fig. 2. Ventral view ♂ *Xylastodoris luteolus* n. sp.
Fig. 3. Venter of ♀ *Xylastodoris luteolus* n. sp.
Fig. 4. Tarsus of *Xylastodoris luteolus* n. sp.
Fig. 5. Wing of *Xylastodoris luteolus* n. sp.

NORTH AMERICAN SARCOPHAGIDÆ: NEW SPECIES FROM BRITISH COLUMBIA AND ALASKA.[1]

By R. R. Parker, Bozeman, Mont.

Sarcophaga savoryi new species.

Male.—Parafrontals and genæ silvery gray pollinose; three rows black cilia behind eyes, lateral verticals absent: third vein with bristles: legs dark, their vestiture short; anterior face of posterior femur with only upper and lower rows of bristles; submesotibial bristle absent; anterior acrostichals present; three pairs posterior dorsoventrals: vestiture of fourth ventral plate erect; posterior margin of fourth notum dull orange or reddish; fifth ventral plate yellowish brown with U-shaped opening on each side of which is a shining pad-like structure; first genital segment with marginal bristles, second dull orange, sub-shining.

Length.—8½–11 mm.

Head.—Parafrontals and genæ silvery gray pollinose. Breadth of front at narrowest part about two-fifths eye width; cheek height about two-fifths that of eye. Front prominent; frontal vitta at its narrowest part wider than either parafrontal. Second antennal segment blackish; third about twice length of second; arista plumose two-thirds way to tip, sometimes more. Three rows of black cilia behind eyes. Cheek vestiture black. Gena with scattered small hairs and a few bristly ones near lower eye orbit. Palpi dark.

Chætotaxy.—Lateral verticals absent; vibrissæ inserted on line with oral margin; about ten pairs of frontals, each row extending slightly below base of second antennal segment and diverging from inner edge of gena.

Thorax.—Mesonotum clothed with short, reclinate bristle-like hairs; vestiture of scutellum more erect and hair-like. Anterior spiracular hairs light colored except basally. Epaulets dark.

Wings.—Bend of fourth vein a right angle; anterior cross-vein more basal than end of first longitudinal; third vein with bristles; costal spine short; section III of costa equal to V and VI; calypters whitish, fringed with white hairs.

Legs.—Dark, vestiture short. Anterior face of posterior femur with only upper and lower rows of bristles; posterior face with ventral row on proximal half or two-thirds; femur straight: tibia straight: tarsus not shorter than tibia. Anterior and posterior rows of bristles of middle femur present on proximal half; posterior "comb" present; sub-mesotibial bristle absent; anterior surface with one long and one short bristle and posterior surface with two short bristles, all close to median dorsal ridge.

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[1] Contribution from the Entomological Laboratory of the Montana State College, Bozeman, Montana.

Chætotaxy.—Anterior dorsocentrals and acrostichals well developed; inner presuturals absent; three pairs posterior dorsocentrals; prescutellar acrostichals strong; scutellar apicals present: three sternopleurals; lower sternopleura with bristles only.

Abdomen.—Clothed above with short bristles, beneath with longer, more erect hair. Vestiture of fourth ventral plate erect. Posterior margin of fourth notum dull orange or reddish. Fifth ventral plate usually well exposed, yellowish brown, with U-shaped opening wider proximally, on each side of which is a shining pad-like structure and posterior to this a "brush" of short bristles.

Chætotaxy.—Second segment without dorsal marginal bristles, third with two.

Genital Segments.—Dull orange, except that first may be brownish anteriorly and dorsally and sometimes whitish pollinose posteriorly: first segment with marginal bristles, scant hairy vestiture posteriorly: second with hairy vestiture longer than that of first. Base of forceps dull orange, bent outward at nearly right angles to prongs, vestiture short; prongs darkened, distal thirds divergent, in profile posterior surface with minute spines; tips bent forward. Accessory plate somewhat drawn out and ending bluntly. Anterior claspers small, with hairs on outer edge near base.

Described from twelve male specimens.

Range.—British Columbia; Savory Island, July 10, 1917; July 2, 4, 7, 8, 1918. (R. S. Sherman): United States: Arizona, Tempe, 4–5–14, D. J. Caffery.

Holotype (male); collection of author.

The holotype was collected on Savory Island on July 5, 1918.

Sarcophaga apertella n. sp.

This species is very similar to *S. savoryi* and differs in the following more essential characters:—parafrontals and genæ dark grayish pollinose, slightly yellowish or brassy; at narrowest part frontal vitta twice width of each parafrontal; arista plumose scarcely more than half way to tip; four rows of black cilia behind eyes; a few bristle-like hairs on transverse impression: anterior spiracular hairs light colored at tips only: anterior face of posterior femur with three rows of bristles; anterior ventral row of bristles of middle femur complete: second abdominal segment with two or three pairs of lateral marginal bristles (one pair in *savoryi*): fifth ventral plate very similar but more brownish, the opening is much narrower and scarcely, if at all, enlarged proximally, the pad-like structures are blackish and smaller, and the "brushes" are smaller: forceps are uniformly dark colored, prongs bent at right angles to base, in profile more slender, tips more strongly bent forward, minute spines as seen in profile near tips only.

Holotype (male); collection of author.

Described from five male specimens.

Range.—British Columbia, Savory Island, July 3, 4, 5, 1918. Collector, R. S. Sherman.

The holotype was taken on Savory Island on July 5, 1919.

The above described species are much more closely related than it has been possible to indicate in the drawings of the genital apparatus. The subdivisions of the penes are seen to be remarkably alike if one has an opportunity to examine the actual specimens. Both species are close to *Sarcophaga magna* Aldrich.

Sarcophaga wrangeliensis n. sp.

Male.—Four rows of black cilia behind eyes; upper frontals as long or longer than lower frontals: hairs at fold of calpyters slightly darkened; posterior face of hind femur with ventral row of long slender, almost hair-like bristles; posterior tibia bearded; middle femur without "comb"; anterior acrostichals absent; three pairs posterior dorsocentrals, sometimes a fourth very weak pair behind the first: abdominal nota with hairy vestiture beneath; fourth ventral plate with short, decumbent bristles on posterior central portion; second segment with or without two marginals, when present may be stout or slender: second genital segment dull orange, shining.

Length.—9–10 mm.

Head.—Viewed from front parafrontals and genæ slightly brassy. Breadth of front at narrowest part about one-third eye width; cheek height about one-third that of eye. Front prominent; frontal vitta at its narrowest part about twice width of either parafrontal. Third antennal segment scarcely twice length of second; arista blackish, plumose for not more than half its length, the plumosity beneath much more scant and about half as long as that above. Four rows of black cilia behind eyes. Cheek vestiture long and hair-like. Gena with a row of hairs near eye orbit and with several bristles below near transverse impression: palpi dark.

Chætotaxy.—Lateral verticals absent; vibrissæ inserted slightly above line of oral margin; about fourteen pairs of frontals, the lower portions of rows widely divergent and extending slightly below base of second antennal segment, the upper bristles (except last) almost as long or longer than lower bristles and scarcely less stout; greater ocellars about as strong as uppermost frontals.

Thorax.—Mesonotum clothed with long, slightly reclinate, slender, almost bristle-like hairs; vestiture of scutellum longer and more erect. Spiracular hairs dark. Epaulets dark.

Wings.—Slightly smoky. Bend of fourth vein a right angle; anterior cross-vein more basal than end of first longitudinal; third vein with bristles; costal spine absent; section III of costa longer than section V; calypters whitish, fringed with white hair, except that those at fold are slightly darkened.

Legs.—Dark. Anterior face of posterior femur with three rows of bristles, those of lower row long, and slender; posterior face with ventral row of quite long slender, almost hair-like bristles: tibia bearded, about same length as tarsus, except for those near median dorsal ridge the anterior face with a single bristle well toward distal end. Middle femur without "comb"; anterior and posterior ventral rows of bristles present, former complete, latter present on distal third and proximal to and slightly above it two long (sometimes three) stout bristles: a few short ones proximally near median ridge; anterior face with a single bristle slightly distal to center; submesotibial bristle absent.

Chætotaxy.—Bristles long and strong. Anterior acrostichals absent, dorsocentrals present, inner presuturals absent; three pairs posterior dorsocentrals, sometimes a fourth very weak pair behind the first, prescutellar acrostichals present, often three intra-alars; scutellar apicals present: three sternopleurals; lower sternopleura with bristles only.

Abdomen.—Vestiture of nota hairy both above and beneath. Fourth ventral plate with short, decumbent bristles on posterior central portion, the bristles longer posteriorly; fifth ventral plate blackish, divided, the inner edges of lamellæ with bristles.

Chætotaxy.—Second segment may be without two dorsal marginals, they may be present and very weak and decumbent or may be well developed; third segment with two dorsal marginals and three pairs of laterals.

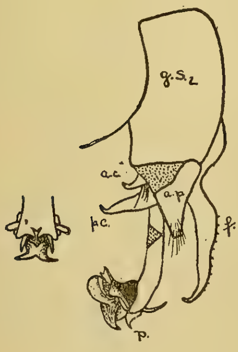
Genital Segments.—First: brownish or black, shining, the posterior portion may be dull orange, vestiture as long as that of second; marginal bristles present; second: dull orange; subglobose; forceps: blackish; broad; vestiture of basal portion long; clothed with hairs about half length of prongs; prongs approximated about two-thirds of length; each prong in profile with edges almost parallel, but the anterior edge slightly sinuate; truncated obliquely forward and ending in tooth, the end third or thereabouts with minute spines.

Holotype (male): collection of author.

Described from six male specimens.

Range.—British Columbia; Vancouver, 5–23–18, (holotype) Caulfields, 5–12–18 (R. S. Sherman); *Alaska;* Fort Wrangel (Wickham).

In the four Alaska specimens examined the upper frontal bristles were longer than the lower ones, while in the two British Columbia specimens the upper and lower bristle were of about equal length. This character differs from that in most *Sarcophaga,* the upper frontals usually being much shorter. The pad-like mat of bristles on the four ventral plates is also uncommon. I have seen this character in but one other species, which occurs in India. The hairy vestiture of the dorsal portion of the abdominal nota is also unusual.



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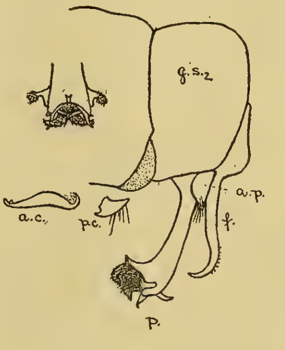

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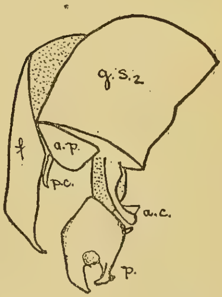

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FIG. 1. Genital segments of *Sarcophaga savoryi* n. sp.
FIG. 2. Genital segments of *Sarcophaga apertella* n. sp.
FIG. 3. Genital segments of *Sarcophaga wrangeliensis* n. sp.

List of Abbreviations.

a. c.—anterior clasper.
p. c.—posterior clasper.
a. p.—accessory plate.
f.—forceps.
p.—penis.
g. $s._2$—second genital segment.

NOTES ON THE FUNGOUS BEETLE, CIS CYLINDRICUS DURY.

BY HARRY B. WEISS, New Brunswick, N. J.

The following notes relate mostly to the early stages of *Cis cylindricus* Dury. On February 15, 1920, Mr. Chas. Dury sent me several pieces of the fungus *Polyporus versicolor* which had been collected in San Francisco, California, and which contained numerous specimens of *Cis cylindricus*. A few beetles were mounted and the remainder placed in a jar together with some pieces of uninjured fungus and the whole thing overlooked until May 10 at which time eggs, larvæ and pupæ were secured. The same species was taken from *Polyporus versicolor* collected by Mr. W. J. Chamberlin at Corvallis, Oregon, in March and from *Polyporus hirsutus* collected in Linn Co., Oregon, during October.

All of the larval feeding took place in the context of the fungus, the channels extending in all directions but most of them being parallel with the surface of the fungus on account of the thinness of the context. The eggs were found at the ends of burrows made in the context and pupation also took place in this part of the fungus, the pupæ being found, as a rule, in the basal part. The beetles appeared to feed on both the context and tubes, the only part left untouched being the upper surface of the pileus.

Polyporus versicolor occurs on all kinds of dead wood and *Polyporus hirsutus* on the dead wood of deciduous trees. Both are common polypores. In confinement, many species of Cisidæ will continue feeding and breeding in dry *Polyporus versicolor* until the fungus has been practically all consumed. In the field, however, perfectly dry specimens of this polypore are not infested to the same extent as those which are more or less moist.

Egg.—Length, 0.43 mm.; width, 0.23 mm. Whitish, translucent, oval.

Full-grown Larva.—Length, 2.4 mm.; width, 0.5 mm. Elongate, subcylindrical, tapering slightly anteriorly and posteriorly, segmentation distinct. Whitish except for mouth parts, tarsal claws and dorsal hooks of ninth abdominal segment which are brownish. Head slightly creamy, narrower than prothorax. Prothorax twice as long as mesothorax. Remaining thoracic and abdominal segments subequal in length. Body segments bear a few fine hairs, more numerous on anal segment. Last abdominal segment bears a pair of minute, slightly recurved, chitinous hooks.

Pupa.—Length, 1.8 mm.; width, 0.7 mm. Whitish, somewhat elongate. Anterior edge of prothorax bears a row of minute tubercles each bearing a fine hair. Several similar tubercles on either side of middle close to posterior edge of prothorax. A comparatively large, blunt median, dorsal tubercle on mesothorax. A few posteriorly directed hairs on dorsal surface of abdomen. Sides of abdominal segments 2, 3, 4, 5 and 6 slightly produced laterally, somewhat tuberculate, each swelling bearing a fine hair. Abdomen terminated by two acutely pointed, slightly diverging, fine spines.

Adult.—*Cis cylindricus.* This was described by Dury in the Jour. Cinc. Soc. Nat. His., Vol. XXII, No. 2, p. 7, Nov. 1, 1917, from specimens collected in Umatilla Co., Oregon, by G. F. Moznette. Mr. Dury states that it is, "Elongate, cylindrical. Black, very like *Cis hystricula* Csy., but differs as follows: Head larger, elytral punctures very coarse and deep, setæ coarse and sparse. Clypeal tubercles porrect. Male with fovea at middle of first ventral segment."

NEW SPECIES OF TENTHREDINOIDEA (HYMENOPTERA).

By Alex. D. MacGillivray, Urbana, Ills.

The following descriptions of new species of Lydidæ and Tenthredinidæ are of species bred by Dr. H. Yuasa during the course of his studies upon the larvæ of the Tenthredinoidea.

Pamphilius unalatus n. sp.—Female. Body black with the following parts white: clypeus, dash along occipital furrows, irregular dorsal band, caudal portion broadest, extending from each compound eye to the caudal margin of the head, occipital orbits broadly, almost connecting with dorsal dash, genal orbits narrowly, lateral portion of collar, tegulæ, two adjacent triangular spots on median lobe of mesonotum, mesoscutellum, metascutellum, small elongate spot on ventral portion of mesopleura, coxæ except proximal portion, trochanters, and femora; following parts rufous: mandibles, tibiæ, tarsi, and abdomen; antennæ black, consisting of twenty-four segments, second segment about one half the length of third, third slightly longer than fourth, fourth and fifth subequal; clypeus broad, truncate; occipital furrows deep and continuous with deep furrows extending to antacoriæ, cuticle cephalad of line drawn through lateral ocelli irregularly roughened, caudad of it smooth and polished; mesonotum, except mesoscutellum, polished; mesoscutellum finely roughened; claws deeply cleft. Length 9 mm.
Habitat: Ithaca, New York. No. 183–1.

This species is related to *dentatus* MacG., but lacks the ocellar basin and V-shaped ridge of this species.

Tenthredo yuasi n. sp.—Female. Body black with the following parts yellowish white: clypeus, labrum, triangular spot on supraclypeal area, genal orbits, ventral half of frontal orbits, collar, and spot above metacoxæ; the following parts dull rufous: antennæ, occipital and vertical orbits broadly, tegulæ, broad V-shaped mark on median lobe of mesonotum, extending onto lateral lobes, mesoscutellum, metascutellum, propleura, mesopleura, spot on metapleura, and mesosternum; abdomen except saw-guides and legs except dorsal surface of metafemora, polished rufous; clypeus broadly roundly emarginate; median fovea wanting; ocellar basin hardly depressed; dorsal aspect of metathorax finely punctured; antennæ with segments four and five subequal, three slightly longer than four; wings hyaline, veins black, costa and stigma rufous. Length 10 mm.

Habitat: Ithaca, New York. No. 8.46–1.

This species is related to *mellina* Nort in the coloration of its body.

Tenthredo smectica n. sp.—Female. Body black with the following parts rufous: antennæ, occipital and vertical orbits, extending slightly onto frontal orbits, tegulæ, legs except proximal portion of procoxæ and exposed surfaces of mesocoxæ and metacoxæ and dorsal surface of metafemora, and abdomen, including saw-guides, beyond the basal plates; following parts yellowish white: clypeus, labrum, triangular spot on supraclypeal area, genal orbits, ventral half of mesal orbits, collar, spot above metacoxæ, and spot on sides of basal plates; clypeus narrowly roundly emarginate; antennæ with fifth segment slightly longer than fourth and third about twice as long as fourth; head finely punctulate, occipital furrows obscure, ocellar basin distinct but not strongly depressed, rounded ridge extending from each antacoria to and bearing a lateral ocellus; notum and pleuræ dull with fine close punctulations; wings hyaline, with scattered black spinulæ, costa and stigma rufous, radius and distal veins black, others rufous. Length 9 mm.

Habitat: Ithaca, New York. No. 8–11–2(?)–2.

While the coloration of the abdomen is very different, this species is related to *neoslossoniæ* MacG.

Macrophya flaccida n. sp.—Female. Body black with the following parts white: clypeus, labrum except a broad X-shaped mark at middle, spot on proximal end of mandible, line on collar and tegulæ, line on coxæ, broadest on metacoxæ, trochanters in part, distal three-fourths of cephalic surface of profemora, distal one-third of cephalic surface of mesofemora, ring on proximal end and spot on distal end of cephalic surface of metafemora, cephalic surface of protibiæ and mesotibiæ, long oblique spot on dorsal surface of metatibiæ, and a ring on proximal segment of tarsi; antennæ with third segment as long as the fourth and fifth together; clypeus emarginate, emargination broadly rounded; median fovea wanting; occipital furrows fovea-like; head uniformly punctulate, without impunctate areas; postocellar area semicircular, broader than long; median and lateral areas of mesonotum finely punctate, mesoscutellum coarsely punctate; mesopleuræ uniformly finely punctate; wings slightly infuscated, veins, including costa and stigma, black; saw-guides with sides parallel, distal end broadly rounded. Length 8 mm.

Habitat: Ithaca, New York. No. 11–1.

Related to *tibiator* Nort. but with a different punctuation of the head.

Macrophya flicta n. sp.—Female. Body black with the following parts white: clypeus, labrum, a line on the mandibles, line on collar and tegulæ, procoxæ, distal half of mesocoxæ, spot on metacoxæ, trochanters, ring on proximal end of femora, cephalic surface of distal four-fifths of profemora, spot on distal end of cephalic surface of mesofemora and metafemora, larger on the former, cephalic surface of protibiæ and mesotibiæ, spot near middle of dorsal surface of metatibiæ, all of tarsi except a distal black ring, and a spot on the mesal part of the basal plates; clypeus broadly deeply emarginate; antennæ with third segment as long as or longer than fourth and fifth together; head setaceous, hoary, especially in antennal region, polished throughout, except for calices for insertion of setæ, larger on postocellar area; median fovea large, deep, twice as long as broad; occipital furrows wanting; mesonotum with sparse fine pits, larger on mesoscutellum; wings hyaline, veins and stigma and costa black; saw-guides with straight dorsal margin, convex ventral margin, and blunt oblique distal end. Length 9 mm.

Habitat: Ithaca, New York. No. 126–3–C–1.

This species is similar to *flaccida* but the smooth head and different shaped saw-guides will differentiate them.

Macrophya fistula n. sp.—Female. Body black with the following parts white: clypeus, labrum, mandibles in part, line on collar and tegulæ, procoxæ, distal end of mesocoxæ, large spot on lateral aspect of metacoxæ, trochanters, cephalic aspect of profemora, distal half of cephalic aspect of mesofemora, ring on proximal and distal ends of metafemora, cephalic aspect of protibiæ and mesotibiæ, short band on dorsal aspect of middle of metatibiæ, tarsi except fuscous ring on the distal end of each segment, and small spot on mesal part of basal plates; clypeus broadly emarginate, bottom of emargination broad and straight; antennæ with third segment about as long as fourth and fifth segments together; round deep fovea on meson about midway between median ocellus and antacoriæ; head densely hoary with numerous fine calices; postocellar area convex, calices larger; antennal, vertical, and ocellar furrows obsolete; prominent polished area between each later ocellus and a compound eye; mesonotum including mesoscutellum punctulate; mesopleuræ with dorsal half finely closely punctured; wings hyaline, costa and stigma and veins black; saw-guides with dorsal margin straight, ventral margin convex, distal end rounded. Length 7 mm.

Habitat: Ithaca, New York. No. 59–4–1.

This species is similar to *flaccida* but the difference in the topography of the head will separate them.

ON SOME SPECIES OF THE GENUS NIPPONAPHIS PERGANDE (APHIDIDÆ, HEMIPTERA).

By Ryoichi Takahashi, Taihoku, Formosa.

Genus *Nipponaphis* Pergande 1906.

Syn. *Schizoneuraphis* Van der Goot 1917.

Up to the present time this remarkable genus has been recorded only from Japan and Java. From the former country four species are now known—*N. cuspidatæ* Essig et Kuw., *N. distylii* Perg., *N. yanonis* Mats., and *N. distyfoliæ* n. sp.

N. cuspidatæ Essig and Kuwana.

The species is very common on the young shoots of *Quercus dentata* and *Q. cuspidata.*

All the other Japanese species of the genus are found on the leaves of their food plants, have alternate hosts and make very prominent galls. *N. cuspidatæ,* however, does not have two hosts but spends the whole life cycle on the *Quercus,* without producing galls at all. The winged forms appear only in the spring and no sexes occur through the year in Tokio.

N. distyfoliæ n. sp.

This aphis produces very prominent galls on the leaves of the winter host, *Distylium racemosum.*

The galls start about April, attaining their full growth and development toward the end of May. The stem-mother is wingless, but the females of the second generation always have wings and migrate to *Quercus glandulifera,* or closely related species, in June.

The females of the third and some of the succeeding generations on the summer hosts are wingless and stationary as in Aleurodes, being firmly cemented to the leaf.

The winged sexuparæ appear in October and November and return to the winter host to produce sexual forms.

The oviparous female, as well as the male, has no wings, but possesses a well developed rostrum, as is characteristic of the Hormaphidina, to which Nipponaphis belongs.

Description.

Migrant (Second Generation).

Color: Head, eyes, antennæ, legs and mesothorax black. Abdomen brownish yellow. Wings pale dusky, veins pale brown.

Morphology: Body oblong, broadest at the middle of the abdomen; without hairs. Head very short, without frontal tubercles; eyes very large; antennæ short, not slender, the two nasal joints, as usual, shortest and nearly subequal in length, the remaining three joints cylindrical and of almost equal thickness, the third longest, nearly equal in length to the fourth and fifth combined, and divided by eight or nine annulations; fourth and fifth segments nearly equal in length, each provided with from three to five annulations. Rostrum not reaching the middle coxæ. Fore wings not narrow; stigma large; the first discoidal thicker than the remaining veins; first and second discoidals arise quite near one another, the third with one fork, obsolete at the base; stigmal vein terminating at the apex of the wing. Hooklets on the hind wing two in number. Abdomen with some very small tubercles on either side; cornicles represented by pores only; anal plate bilobed; cauda very short and not prominent.

Legs slender, with some fine short hairs and also with four long capitate hairs.

Length of body—1.4 mm. Length of antenna—0.35 mm.

Length of fore wing—1.8 mm. Width of fore wing—0.7 mm.

CHANGE OF NAMES IN COLEOPTERA.

By Chas. Schaeffer, Brooklyn Museum, Brooklyn, N. Y.

Mr. Julius Weise recently called to my attention that a few of the new names in my paper on species of the family Chrysomelidæ in Journal N. Y. Ent. Soc., XXVII, pp. 307–340, have already been used. I propose, therefore, the following changes:

Donacia assimilis Lacordaire = *Donacia glabrata* Schffr. Journ. N. Y. Ent. Soc., Vol. XXVII, p. 313.

The name *glabrata* is preoccupied by Solsky for a Silician species, however, studying lately very closely the descriptions of the species of *Donacia* described by Lacordaire from North America I have very little doubt that my *glabrata* is the same as *assimilis*. The latter is wrongly made a synonym of *palmata* with which it cannot be associated, the deep, large, median impression and sculpture of prothorax, the shining, glabrous surface and the unarmed posterior femora in both sexes are characters entirely foreign to *palmata*. *Donacia glabrata* is the only described species which fits the description of *assimilis* best.

Melasomida new name.

Pseudolina Schffr. Journ. N. Y. Ent. Soc., Vol. XXVII, p. 330.

Pseudolina is already in use by Jacoby for an East Indian genus.

Colaspis weisei new name.

Colaspis subœnea Schffr. Journ. N. Y. Ent. Soc., Vol. XXVII, p. 328.

There is already a species described as *Colaspis subœnea* by Jacoby from Guatemala.

BOOK NOTES.

Inbreeding and Outbreeding, by Edwin M. East, Ph.D., and Donald F. Jones, Sc.D. (Monographs on Experimental Biology, J. B. Lippincott Co., $2.50.)

This is the fourth to be published of these monographs. While it cannot, in its very nature, be exhaustive, this volume gives an adequate account of its subject. It applies the discovered facts to the future of the human race. The non-technical reader will find in this work an interesting and connected account of much highly technical matter, frequently too abstruse for any except the highly specialized geneticists. The first ten chapters lead up to the last three, which develop and apply the practice of inbreeding and outbreeding to plant and animal improvement, and indicate their effect on individual men and on the race as a whole. As a part of the general literature of the theory of evolution, or transformism, this work developes one of its phases in relation to ourselves as a race, as individuals and as progenitors.

Some Habitat Responses of the Large Water-Strider, Gerris remigis Say. C. F. Curtis Riley. (Am. Nat., LIII: 394–414, 483–505, 1919; LIV: 68–83, 1920.)

This is one of those time-consuming yet necessary pieces of work, whose results, in the very nature of things, must lack the clean-cut finality of an euclidean demonstration.

Dr. Riley has painstakingly and systematically worked out the responses of water-striders in their natural habitat, his work lapping over three years. The net result is that water-striders always endeavor to reach water. If the water is perceptible to their senses, which it appears to be up to 12 feet distant, the insects orient themselves and easily reach it irrespective of the direction in which the water lies from them. Beyond that distance, they resort to trial and error, like any other animal. He has thus shown that which other observers have known in a sketchy, general way. He has also shown, as a by-product, that there is some measure of thought and actual volition involved in these responses, which can scarcely be interpreted as a mere tropistic reaction to external stimuli. This last is borne out by the fact that under certain conditions the sense of sight came into play, while under others some perception of moisture seemed to give the direction.

Such work as this, while tedious in comparison to the positive discoveries made, must be done if we are to have facts to work on. The aquatic Hemiptera offer great opportunity for such controlled experimentation under natural conditions.

J. R. T. B.

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BULLETIN
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Vol. XV DECEMBER, 1920 No. 5

A SYNOPSIS OF THE NORTH AMERICAN SPECIES OF THE GENUS PEGOMYIA ROBINEAU-DESVOIDY (DIPTERA, ANTHOMYIIDÆ).

By J. R. Malloch, Urbana, Ills.

The species included in the key all conform to my recent diagnosis of this genus. All have but two posterodorsal bristles on the hind tibia except *triseta* and *bicolor* which have frequently three, and the most of the species have also only two anterodorsal hind tibial bristles. In the great majority of cases the legs are partly or entirely reddish or yellowish, and in many cases the abdomen is also partly pale. No species known to me has a blunt bristle at apex of fore tibia on the posterior side, and no species has the hind tibia in male with short erect hairs on ventral surfaces.

Key to Species

Males

1. All femora entirely pale or only the fore pair partly infuscated 2
— All femora partly or entirely infuscated 28
2. Prealar bristle less than half as long as the one behind it 3
— Prealar bristle over half as long as the one behind it.. 20
3. Length of third antennal segment greatly exceeding height of cheek; distance between vibrissae twice or more than twice as great as distance from either to nearest point of eye-margin; abdomen depressed; all femora pale; lower calyptra usually distinctly protruded 4

— Length of third antennal segment not as great or very slightly greater than height of cheek; abdomen cylindrical; lower calyptra not distinctly protruded.... 12

4. Fifth abdominal sternite blackened, furnished with a fringe of long erect fine black hairs along the inner margins of the processes; third antennal segment not over twice as long as second; thorax and abdomen yellowish testaceous, the latter with narrow dark posterior margins to the tergites and with a faint dark dorso-central vitta; third sternite about 1.5 as long as wide ....*luteola* Malloch

— Fifth abdominal sternite not as above 5

5. Species entirely pale testaceous yellow, including antennæ; lower calyptra distinctly protruded; hind tibia with three anterodorsal bristles; longest hairs on arista a little longer than its basal diameter...*unicolor* Stein

— Species not entirely pale yellowish testaceous, at least the third antennal segment darkened 6

6. Hind femora and tibiæ with exceptionally long bristles, the distal one on posterodorsal surface of tibia half as long as tibia ....*rufipes* Fallén

— Hind femora and tibiæ with normal bristling, the distal one on tibiæ not nearly half as long as the tibia.... 7

7. Hind tibia with two anterodorsal bristles; mesonotum entirely yellowish testaceous, or with a gray central vitta 11

— Hind tibia with three anterodorsal bristles; mesonotum largely or entirely fuscous 8

8. Scutellum black; processes of fifth sternite glossy brownish black, without hairs or bristles on outer surfaces, each process with a clawlike spur on inner side near apex, the base of which is on inner margin of process; basal segment of hypopygium with long bristly hairs ....*unguiculata* Malloch

— Scutellum largely yellowish; fifth sternite not as above. 9

9. Palpi infuscated apically; anterior lateral angles of thorax and scutellum yellowish testaceous; arista with its longest hairs a little longer than its basal diameter; lower calyptra distinctly protruded; scutellum almost bare on disc; posthumeral bristle not duplicated, the area between posthumeral and margin of thorax almost bare ....*winthemi* Meigen

— Palpi entirely pale; posthumeral bristle duplicated... 10

10. Anterior lateral angles of thorax and scutellum testaceous; tibial bristles strong, the posterodorsal surface of

hind tibia often with three bristles; arista almost bare except on apical half; antennae largely or entirely rufous yellow ....*triseta* Malloch

— Anterior lateral angles of thorax black, scutellum testaceous at apex; tibial bristles comparatively short and weak; hind tibia with two posterodorsal bristles; arista with the hairs on basal half at least as long as its basal diameter; third antennal segment largely or entirely infuscated ....*fuscofasciata* Malloch

11. Abdominal tergites each with a distinct narrow fuscous fascia on posterior margin; hypopygium large. *vittiger* Zetterstedt

— Abdominal tergites without fuscous fasciae; hypopygium small ....*geniculata* Bouché

12. Posthumeral bristle duplicated, numerous hairs usually laterad of posthumeral; hind tibia with three or more anterodorsal bristles; third wing-vein always bare at base 13

— Posthumeral bristle not duplicated, the area laterad of it bare or with a few setulose hairs near bristle; hind tibia with two anterodorsal bristles; third wing-vein usually with a few weak hairs at base 16

13. Palpi blackened at apices; abdomen blackish gray, with a black dorso-central vitta; fifth sternite with the processes tapered to apices, the inner margin of each concave near middle ....*hyoscyami* Panzer

— Palpi entirely pale; abdomen reddish testaceous, with a darker dorso-central vitta; fifth sternite with glossy processes which are not tapered to apices, but usually slightly dilated or knobbed at tips 14

— Palpi entirely pale; processes of fifth sternite not glossy, tapered to apices, which are slightly pointed 15

14. Hind tibia with three posterodorsal bristles; scutellum entirely, fore femora largely black; processes of fifth sternite blackened apically ......*bicolor* Wiedemann

— Hind tibia with two posterodorsal bristles; scutellum partly and fore femora largely or entirely reddish testaceous; processes of fifth sternite blackened apically. *calyptrata* Zetterstedt

— Hind tibia with two posterodorsal bristles; thorax entirely brownish black; all femora testaceous, darker in middle; processes of fifth sternite not blackened apically. ....*minuta* Malloch

15. Third antennal segment with a transverse pale area at base on inner side which is slightly elevated and presents the appearance of an overlapping scale; fifth sternite with rather conspicuous black hairs in a series near inner margin on basal half of each process which give the sternite the appearance of having a black fringe on each side of incision ....*ruficeps* Stein

— Third antennal segment with but slight indications of the pale scale like mark on inner side at base; fifth sternite with a few inconspicuous dark hairs. .*rufescens* Stein

16. Mid femur with a very strong bristle on anteroventral surface at or beyond middle; costal setulae much longer than diameter of costal vein 17

— Mid femur without such bristles; costal setulae very weak 18

17. Cheek much higher than length of third antennal segment; hind femur with a regular series of 6 or 7 widely spaced anteroventral bristles. *spinosissima* Stein

— Cheek barely higher than length of third antennal segment; hind femur with 2 or 3 bristles on basal half and 2 or 3 on apical half of anteroventral surface, with a rather wide space between the series. *spinigerellus* Malloch

18. Arista with dense pubescence, its longest hairs at least as long as its basal diameter; third antennal segment largely yellowish ....*gopheri* Johnson

— Arista with barely distinguishable pubescence 19

19. Third antennal segment largely yellowish; mid tibia with a median anteroventral bristle ....*finitima* Stein

— Third antennal segment generally deep black; mid tibia without a median anteroventral bristle. . .*affinis* Stein

20. Thorax reddish testaceous, with a fuscous dorsocentral vitta; hind tibia with a posterior bristle one third from base ....*labradorensis* Malloch

— Thorax black; hind tibia without a posterior bristle. . 21

21. Thorax when seen from above and behind with a broad, deep black shining vitta on each side; palpi entirely black 22

— Thorax sometimes more or less distinctly vittate but not as above 24

22. Longest hairs on arista as long as width of third antennal segment; fifth sternite with dense brushlike fringe of stiff, short, black setulae on basal half of inner margin of each process ....*juvenilis* Stein

— Longest hairs on arista not nearly as long as width of third antennal segment; fifth sternite not as above. 23

23. Antennae with apex of second segment and base of third conspicuously reddish; arista with sparse short hairs; hind tibia with a posterior bristle in line with upper posterodorsal one .... *emmesia* Malloch

— Antennae with entire second segment and a large portion of third reddish; arista densely pubescent; hind tibia without a posterior bristle .... *lipsia* Walker

— Antennae entirely black; arista almost bare; hind tibia without a posterior bristle........ *lativittata* Malloch

24. Mid femur with a strong bristle beyond middle on anteroventral surface; second antennal segment reddish at apex 25

— Mid femur with a strong bristle as above; second antennal segment entirely black .... *lativittata* Malloch

— Mid femur without an anteroventral bristle beyond middle; second antennal segment entirely reddish. 27

25. Fifth sternite and hypopygium ferruginous; thorax with one pair of moderately long presutural acrostichals; fore tibia with one anterodorsal and two posterior bristles .... *subgrisea* Malloch

— Fifth sternite and hypopygium black; thorax with two pairs of strong presutural acrostichals; fore tibia with one anterodorsal and one posterior bristle...... 26

26. Mid tibia with an anteroventral bristle; fore femora almost entirely black; fore coxæ black. *quadrispinosa* Malloch

— Mid tibia without an anteroventral bristle; fore femora with a blackish stripe on upper surface; fore coxæ black in front .... *flavicans* Stein

27. Hind tibia with one anteroventral bristle *duplicata* Malloch

— Hind tibia with two anteroventral bristles. *substriatella* Malloch

28. Abdomen with an interrupted dorsocentral vitta, and a spot on each side of each tergite, giving the abdomen the appearance of having three series of black spots on dorsum .... *acutipennis* Malloch

— Abdomen with or without a blackish dorsocentral vitta, without the lateral spots 29

29. Mid tibia with a median anteroventral bristle; mid femur with one or more strong bristles beyond middle on anteroventral surface .... *apicalis* Stein

— Mid tibia and mid femur without bristles as above... 30

30. Tibiae largely or entirely reddish 31

— Legs entirely black 35

31. Parafacial in profile much wider than third antennal segment, at base of antennae; prealar bristle half as long as the bristle behind it; the extra posthumeral bristle very long 32
— Parafacial at base of antenna not as wide as third antennal segment; prealar bristle less than half as long as the one behind it 33
32. Processes of fifth sternite not flattened, glossy, bare at apices ....*jacobi* Malloch
— Processes of fifth sternite flattened, glossy, and armed with setulose hairs at apices; mid tibia with an anterior bristle ....*vanduzeei* Malloch
33. Hind femur with a series of short, stout, rather closely placed bristles on basal half of posteroventral surface; fifth sternite with dense, erect, stiff black hairs on inner half of each process ....*pedestris* Malloch
— Hind femur with a number of long, widely placed bristles on basal half of posteroventral surface; fifth sternite with dense, erect hairs near base of each process.. 34
34. Palpi and antennæ black; processes of fifth sternite bare at apices ....*fringilla* Malloch
— Palpi and second antennal segment rufous; processes of fifth sternite with a number of short stiff setulæ at apices ....*vanduzeei* Malloch
35. Hypopygium very large; third antennal segment not twice as long as second; hind tibia with three anterodorsal bristles ....*rubivora* Coquillett
— Hypopygium small or moderate in size; hind tibia with two anterodorsal bristles 36
36. Deep black species, with very faint grayish pruinescence on thorax, the abdomen densely drab-gray pruinescent; prealar one third as long as the bristle behind it ....*littoralis* sp. n.
— Black species, with dense whitish gray pruinescence on both thorax and abdomen; prealar bristle absent or minute ....*slossonæ* sp. n.

Pegomyia acutipennis Malloch.

Stein has erected a genus *Enneastigma* for the reception of a species which very closely resembles this one. The only character which he cites for the separation of the genus from its allies is the tripunctate abdomen. In view of the fact that there does not appear to be any real structural character for the separation of *acutipennis* from the other species in the group in the foregoing key I have not removed it to Stein's genus, which may really be entitled to generic rank.

Pegomyia littoralis n. sp.

> *Male*—Entirely black, shining. Abdominal dorsocentral vitta linear. Wings slightly infuscated. Calyptrae white. Halteres yellow.
>
> Frons as wide as distance across posterior ocelli; arista pubescent. Thorax with two or three pairs of presutural acrostichal bristles; prealar small. Abdomen tapered to apex, depressed; hypopygium small; fifth sternite with short processes which are rounded at apices, have a few long hairs at bases of processes and are almost bare beyond. Hind femora with irregular bristles on anteroventral surface and some bristles on basal half of posteroventral; hind tibia with one anteroventral, two anterodorsal, and two posterodorsal bristles. Wings slightly pointed, first posterior cell narrowed at apex. Length, 4.5–5 mm.

Type, Mt. Cadillac, Mt. Desert, Me., July 25, 1919. Paratypes, three males, Bar Harbor, Me., July 21–22, 1919 (C. W. Johnson).

A female which appears to belong to this species has the frons reddish anteriorly, one third of the head-width, and with a pair of cruciate interfrontal bristles.

Locality, Fogo Island, New Foundland, July 29.

Pegomyia slossonæ n. sp.

> *Male*—Similar in general color and habitus to *littoralis*, but with pale gray pruinescence, and a much broader dorsocentral abdominal vitta.
>
> Frons barely wider than anterior ocellus, the orbits silvery. Prealar absent. Fifth sternite with the inner margins of the processes widely divergent apically, no long hairs at bases of the processes. Otherwise as *littoralis*. Length, 5 mm.

Type, Mt. Washington, N. H., 2,500 feet, June 14, 1916 (C. W. Johnson).

Named in honor of Mrs. A. T. Slosson who has done so much collecting in the region where the type was taken.

MATING HABITS OF SPHECIUS SPECIOSUS, THE CICADA-KILLING WASP.

By Wm. T. Davis, Staten Island, N. Y.

On July 31, 1919, the writer was on the grassy lane leading down to the shore of Long Pond, south of Wading River, Long Island, N. Y., when he observed many males of *Sphecius speciosus* flying about. They would station themselves on the tops of plants, or on small bushes, and when a female came near they would fly after her. Each male had a particular flower head, or other lookout, to which he would return after chasing a female, and some that were watched went back to their chosen stations with great regularity for over a half hour. The mating takes place in the air and is very brief. Twelve of these matings were observed. Sometimes the pair fell to the ground, but flew away quickly.

On the third of August the pond was again visited, and the wasps were still about the same place on the grassy lane, and the males chasing the females. Several of them were observed to fly from their place of out-look, seize a female in mid air, and then after leaving her return to their particular station. While no tunnels dug by *Sphecius* could be found where the mating was going on, in other places, higher and dryer, there were several, and in one instance it appeared from the rounded groove at the opening of the burrow, that a cicada had been brought in. The greatest activity in collecting cicadas on Long Island occurs about the middle of August or a little later, and many cicadas have, fortunately for the species, commenced to lay eggs before their sudden demise. The female *Sphecius* seeks them, not by the song of the males as is sometimes stated, but by flying carefully along the limbs of trees and up and down the trunks, and so catches both sexes. In some of the burrows dug out, there were many more females than males. When a cicada is discovered and stung by a wasp, the pair sometimes fall to the ground, but often the wasp succeeds in holding fast to both the tree and the cicada. If the cicada is too heavy to be transported directly to the burrow, the wasp climbs up the trunk of a tree with its victim, holding the cicada by the legs with the smooth back downward, so that it can be slid along more easily, and then flying from its point of vantage, it may make a considerable distance toward its nest before being borne down again by the heavy burden.

In *Insect Life,* Vol. IV, p. 248, a digger-wasp is shown by Dr. Riley holding a cicada with the legs downward. This figure has been copied in Howard's Insect Book, and in the List of New Jersey Insects. In the writer's experience the cicada is held with the legs upward, thus giving the wasp a firmer hold and making transportation more easy. This was pointed out in some notes on the habits of the larger digger-wasp, printed in the Canadian Entomologist, for January, 1891.

It may be of interest to add that the Cicada-killer on Long Island and Staten Island, collects indiscriminately *Tibicen sayi, T. linnei, T. lyricen* and *T. canicularis,* often placing more than one species in the same burrow. No doubt the larger *Tibicen auletes* is also captured on occasion. The Seventeen-Year Cicada appears too early in the season on Staten Island to fall a prey to the wasp.

NOTICES.

Subscribers will please note that our April–June issue was a double number (Nos. 2 and 3). Owing to an oversight, 3 was omitted on the cover, although it will be found in its proper place on the first page.

Title page and index for this volume will be issued with No. 1, Vol. XVI, for February, 1921.

COLLECTING LIBYTHEA BACHMANI.

By E. L. Bell, Flushing, N. Y.

It may interest collectors of Lepidoptera to record the taking of two specimens of *Libythea bachmani,* Kirtland, at Kings Park, Long Island, N. Y., on July 20, 1920, and to give some of the details attending their capture.

On the afternoon of the day mentioned I had spent a couple of hours collecting along a road running through the woods. Having met with very little success I was returning home, hot and nearly convinced that there wasn't anything to collect that was worth collecting. As I walked along I saw a butterfly alight among the lower bushes at the edge of the road a short distance ahead of me, and at the moment thought it was one of the Satyrs which were quite common in that neighborhood. As I came nearer to it, it flew up and I saw it was quite a different thing. With a rather quick and erratic flight it flew along the roadside, at times fifteen or twenty feet in the air, and then among the low bushes, pausing an instant on some leaf or bare twig, and then resuming its erratic flight. I managed to overtake it, and during one of its momentary pauses saw that it was *Libythea bachmani.* It was some distance further along the road before a favorable opportunity came to net it as it perched upon the tip of a dead twig.

On returning along the road the bushes were eagerly scanned for more specimens and at almost the end of the woods two more were seen playing or fighting just above the top of a small wild cherry tree, about ten feet from the ground. They flew this way and that, darted high in the air and then swiftly descended to the tree top, perched there a few moments, then repeated their antics —all the time keeping well beyond my reach. After about half an hour of this exasperating performance one alighted on a leaf of a branch lower than usual. By a running jump I managed to sweep it into the net. The remaining one played around for a short while longer, but never came within range of my net, and finally flew off, keeping high above the road.

This spot was visited daily thereafter for a week but no more of this interesting little butterfly were seen. The two specimens collected were a male and a female, in a rather flown condition.

THE RESPIRATION OF AQUATIC INSECTS.

A Collective Review.

By Richard A. Muttkowski, Ph.D., University of Idaho.

(*Continued from page 96.*)

5. *External Oxygenation.*

(*a*) *At the Surface.*—External oxygenation is related to surface-breathing. It is needful to consider the latter. Most insects of this type must come to the surface at some time or other for their oxygen. Many take the air directly into the body by means of the caudal spiracles (larvæ of Dytiscidæ, Hydrophilidæ, *Stratiomyia,* etc.), others form a plastron of air on the underside and also store it under the elytra (adults of Coleoptera, Corixa and Notonecta, nymphs of the latter two on the underside). The devices for clinging to the surface of the water while breathing atmospheric air are too well known to need repetition. But in surface-breathing the question of accidental entry of oil and water through the caudal spiracles is important. It is probably a little known fact that dragonflies in the last instars are able to breathe with their thoracic spiracles and wander freely from both media (air and water) without difficulty. In some experiments with various insects in studying defensive devices against oil and water Portier found that hydrofuge surfaces and special absorptive tissues are the chief means of defense. The Odonata, however, have thoracic spiracles which permit the entry of neither oil nor water; that is, they are both oleofuge and aquifuge. In the case of hydrofuge surfaces it has been found that mere contact with oil will destroy the effectiveness of that surface. Hence, it is not surprising that although the caudal spiracles of so many aquatic larvæ are surrounded with hydrofuge surfaces, oil and water may get it in spite of these surfaces. (The chief means of mosquito control is based on the foregoing principle.) In the case of the Odonata the superposition of hydrofuge and oleofuge surfaces in the form of superposed plates prevents the entry of either oil or water (Portier).

Some larvæ, such as the Tipulidæ, draw in the caudal segments by retractor muscles and thus close the spiracles. In *Hydrophilus* larvæ water may enter one tracheal trunk; it is passed through a communicating ramus to the other trunk and ejected, the ejecting mechanism being unknown (Portier). Still others, and this applies to most larvæ, have a spongy network of tissue next to the stigmata, which absorbs any oil and water that happens to enter. Finally, *Dytiscus* larvæ have a slightly altered form of the tracheæ which lends itself very readily to absorption of foreign fluids. The tracheal trunks are flattened, a cross-section showing a contour which much resembles that of the human eyelids when widely opened; the angles attract the foreign liquid and the lumen remains unobstructed.

(*b*) *Below Surface.*—Many surface-breathers are held below surface for more or less prolonged periods, especially during hibernation. We know that a small amount of oxygenation may take place through an air-bubble in the water and also through the plastron of an aquatic insect. But this film of air cannot be likened to a true membrane. Insects held under the surface may capture oxygen bubbles secreted by plants (Wesenberg-Lund, personal observations). In fact, they may do this frequently during the year, even when they can conveniently reach the surface. Many beetles do this. Also mosquitoes have been observed thrusting their caudal spiracles into an air-bubble and drawing it into their body. Plastron insects will fuse such a bubble with their plastron. (Parenthetically, mosquito larvæ also have caudal blood gills for oxygenation. Let us suppose that some mutant became a permanent water-breather by means of such gills. What of the present means of mosquito control? What of the future domination of the world?)

(*c*) *Permanently Below Surface.*—Some very special adaptations have been evolved by plastron insects that are found permanently below the surface, or come up comparatively rarely. They are the adult Coleoptera: *Elmis, Limnius,* and *Stenelmis,* of the Parnidæ, *Hœmonia* of the Chrysomelidæ, and *Hydrophilus.* The latter two are also plentiful at the surface. Now let us distinguish at once: *Hydrophilus* has the underside fitted with hydrofuge hair which helps to hold the external plastron of air. The other four have sternal hair which is hydrofuge *at the base,* but *not* hydrofuge at *the tip.* The tips of these sternal hairs actually extend *beyond* the air plastron and form a coat for the plastron. This outer film of hair tips operates precisely like a membrane: oxygen is *absorbed* through it from the water (Brocher). A bubble coming in contact with such a "hair membrane" is *absorbed,* it decreases in size until it disappears. *Hydrophilus* and all other plastron insects differ in that they *fuse* an air-bubble with the plastron.

Now, it is decidedly interesting that *Hydrophilus* tries to achieve a similar result, *i.e.,* oxygen absorption from the water, from a different angle, but by the same means, namely by partly aquifuge hair, on the antennæ. The hairs have aquifuge bases and miscible tips,—hence *Hydrophilus* is able to absorb oxygen from the water by means of the antennæ. In this fashion the antennæ constitute a tunnel leading the air to the base of the antennæ, and then to the plastron of the head. *Hæmonia,* it is interesting to note, has both this antennal "hair membrane" besides the sternal "hair membrane." The relation of these five genera in their types of respiration may be indicated in the following table:

	Elmis	With miscible plastron hair membrane, *i.e.,* sternal hair aquifuge at base, miscible with water at tips, forming "hair membrane" for absorption of oxygen in solution in the water.
	Stenelmis	
	Limnius	
With miscible "hair membrane" on antennæ	*Hæmonia*	
	Hydrophilus—plastron of ordinary type, *i.e.,* hairs aquifuge to tips.	

6. *The Entry of Air into the Closed System of the Embryo.*

One of the puzzling problems of respiration of aquatic insects has been to ascertain how the air gets into the tracheæ in the first place. In the insect embryo the tracheæ are filled with a serous fluid. When the young larva leaves the egg, the fluid is still within the tracheæ. Suddenly these tracheæ can be seen to fill with air. This filling takes place rapidly, it is a matter of a few seconds. The problem had been investigated by Weisman, Plateau, Sadones, Calvert, Dewitz, and others, without a satisfactory solution. Indeed, Weisman postulated a temporary opening of the stigmata to the atmospheric air. But after it had been shown by Calvert and Dewitz that the filling proceeds while the larva is submerged this idea was abandoned.

It is one of the interesting coincidences that we so often find in scientific research, that two separate investigators should simultaneously arrive at similar conclusions on this question. These two are Tillyard in Australia working with dragonfly larvæ, and Franckenberg in Germany working with *Corethra* larvæ. Both investigators ascertained that the tracheæ will fill with air even when the larvæ be placed in deoxygenated water. Both therefore concluded that the primary filling must come from within and is not a diffusion process.

are

Let me describe this process of filling. In *Corethra*, the so-called "phantom" larvæ, there are four air chambers connected by tracheæ. Filling begins at the rear behind the posterior chambers; these fill first, then the air can be seen advancing in the lumina of the connecting tracheæ, and finally the anterior chambers fill. In the Odonata the process is reversed. The tracheæ lying next the cephalic heart (found only in late embryos and temporary in nature) fill with air, this air column is seen to move in a posterior direction along the main trunks to the rectal gills, which then begin to operate at once, the gaseous air appearing to be the stimulus requisite for operation. In each case this filling occupies just a few moments, from three to ten seconds, rarely as much as half a minute. To be sure of the details Tillyard in an ingenious experiment was able to slow up the filling so that it covered a period of several minutes.

It must be noted that this sudden air supply cannot come from the outside of the larva, as endosmosis is not rapid enough to account for the rapidity of the filling. Furthermore, this change will take place in water free from oxygen, hence in conditions which bar the possibility of endosmosis altogether. Both authors, Tillyard and Franckenberg, assume that the blood of the embryo must hold air to a point of supersaturation, and that it goes out of solution with such force that the serous fluid filling the tracheæ is forced through the tracheal walls into the body cavity. Now, what is this gas? Tillyard states that it is carbon dioxide, Franckenberg calls it oxygen. Franckenberg postulates some gland in the embryo which is able to fix oxygen in considerable quantities, and that this oxygen is so loosely bound that it dissociates with nearly explosive force (in fact, the explosions disrupt the air chambers and the larva itself when put under diminished pressure), pushing the serous fluid before it in its progress through the tracheæ toward the head. The gland Franckenberg locates behind the posterior chambers in *Corethra*. In proof he cut off the posterior of the larva and prevented a filling. If he cut in front of the posterior chambers, these filled up. Another proof is adduced: the air in solution in the water in which the embryo lay was analyzed. The embryo was then removed to deoxygenated water for a few minutes until its tracheæ filled with air. This tracheal air was then analyzed and found to be the same in the chambers as in the water from which the embryo had originally been taken. On this basis Franckenberg postulates some gland able to fix oxygen in quantities and carry it over till needed.

In contrast to this Tillyard experimented with potassium hydroxide and baryta water, to ascertain the composition of the air in the tracheæ immediately after filling. The chemical tests satisfied him that it was carbon dioxide. Tillyard states that the process is a purely mechanical one, that the CO_2 represents the waste accumulations of the histolytic processes of the embryo, which go out of solution with sufficient force to displace the serous fluid that filled the tracheæ primarily. The process is analogous to the behavior of carbonated water. Release the pressure, and the carbon dioxide goes out of solution at once, effervescing freely. The same may be observed when water is taken from the bottom of deep lakes and exposed to the air; the carbon dioxide goes out of solution with much hissing and effervescence.

Tillyard's theory is probably the better of the two. Since Franckenberg's analyses were not made until some time after filling of the tracheæ, it is probable that the carbon dioxide had already diffused through the cuticle and was replaced by oxygen from the water or blood (see section 7). At the time Tillyard's paper was published he did not know of Franckenberg's work, of which I wrote him. Tillyard's reply was as given above, with the further note that he started out to prove the oxygen theory of filling and proved the opposite.

7. *Air of Transformation.*

(*a*) *Filling of Pupal Tracheæ.*—The process is slow. The pupæ of holometabola acquire practically a complete new system of tracheæ. This system, curious to say, fills with air from the blood, and not from without. This can be readily demonstrated by placing larvæ about to pupate in deoxygenated water.

(*b*) *The Process of Transformation.*—The process of final ecdysis is primarily a process of inflation with air (Portier), so that the enclosing chitinous envelope splits at a definite point. Here we have what might be called *internal inflation,* and *external inflation.*

Internal inflation occurs among hemimetabolic insects which secrete air into the digestive tract (Portier) which swells like a tube within a tire and breaks the outer shell of chitin. Portier found the alimentary tract of transforming Odonata larvæ enormously expanded, its walls closely appressed to the body wall. What the mechanism of secretion of air into the intestine consists of must still be ascertained.

External inflation occurs primarily among holometabola. Here during pupation a layer of air can be seen to form between the adult and the pupal skin proper. Take, for instance, a *Chironomus* pupa. The brown larva transforms into a red pupa—a matter of a very few minutes—and through the skin the animal can be seen. Soon one notices that within the pupal membrane a second one has formed, a little later one notices a sheet of air accumulating between the two. Contact with the outer air in solution in the water is maintained through the cervical tracheal tufts and the caudal tracheal plates. The amount of air increases until the pupa becomes buoyant and slowly rises to the surface. What is the air between the forming adult and the pupal skin? Of course, it is easy to assume that it is probably oxygen, but an assumption is not proof. One may equally well assume that it is carbon dioxide, since during this period histolysis proceeds with enormous rapidity and waste carbon dioxide is formed in quantities. Some years ago I tried some experiments on this point, but failed owing to faulty technique. Just one experiment was positive and seemed to indicate considerable carbon dioxide present. This phase also needs further investigation.

During the pupal period of histolysis a tremendous amount of carbon dioxide and other wastes are accumulated and stored in various ways, chiefly as carbonic acid and uric acid, and this is voided shortly after ecdysis in the form of viscid, often colored droppings, such as the brown, red, or green droppings of Chironomids, etc. These are usually acid in reaction, and the assumption is that they are composed of carbonic acid, uric acid, and other wastes. This is by no means clear, and needs further attention.

8. *Storage of Air for Static Purposes.*

Most of the plastron insects, besides the sheet of air on their sterna, store air under the elytra. The natural effect of the sternal plastron would be to turn the insect upside down, because of the greater buoyancy of the air plastron. Brocher working on beetles and Hemiptera found that buoyancy in the upright position is due to the storage of air under the elytra. If the air under the elytra was removed the insect was unable to maintain its proper position and was inverted. Brocher further found that there is a delicate counterbalance between the amount of air held for buoyancy and breathing and the weight of the insect. In most cases the amount of air was sufficient to carry the insects to the surface, so that if an insect were to remain submerged it had to cling to some plant or other object to prevent its ascent.

Certain permanently water-breathing adult beetles (*Elmis*, *Stenelmis*) have the power to increase or decrease the amount of buoyant air and hence are able to raise or lower themselves at will and to remain suspended in the water (Brocher). Air is secreted and forced under the elytra and this automatically lifts them in the water to any desired level. Suspension is most highly developed in *Corethra* larvæ. *Corethra* adjusts itself very rapidly to change in pressure, requiring only a few minutes to adjust to a decrease from 22 milligrams pressure to 10 mmg., or to an increase of two to three times atmospheric pressure (Franckenberg). Because of this ready adjustment one can understand very well how it is possible to find *Corethra* at the surface of a lake during the night,—say at nine o'clock in late June, and at the bottom eighty feet down just an hour before,—hence a change of two atmospheres pressure.

9. *Inspiration and Expiration in Adults.*

In adult beetles (*Hydrophilus, Dytiscus, Agabus,* etc.) Brocher found that certain spiracles are used primarily for inspiration, and others for expiration, while still others remained functionless. Depending upon the respective species, the thoracic spiracles might be used for inspiration or expiration. The same held true for the first abdominal and caudal stigmata, which were the chief ones used for either inspiration or expiration.

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REMARKS ON HETEROPTERA IN BEACH DRIFT.

By J. R. de la Torre-Bueno, White Plains, N. Y.

The finding of insects in beach washup on the tide-line is always of interest, not alone because in the Heteroptera this is a most favorable place to find ordinarily rare forms, but also because of the problem of *why* insects fly out to sea. The little collection made at Atlantic City, N. J., on October 11, 1919, illustrates well the first point. One species, *Cyrtomenus mirabilis*, has been but seldom recorded from New Jersey, which appears to be its most northern range and it has not been recorded from between that state and South Carolina. Two others, *Aradus niger* and *Fitchia aptera* are very rare in the winged form.

Cyrtomenus mirabilis Perty. One was found dead and dry high up on the beach, on the high tide line.

Amnestus spinifrons Say. Two were found in the water of the receding wavelets. This has been previously reported from Long Island under the same conditions.

Thyreocoris lateralis Say. This species has not before been recorded from drift; two were found.

Peribalus limbolarius Stål. One specimen.

Podisus modestus Dall. One specimen, badly damaged. This and the preceding have not heretofore been reported from drift.

Nysius ericæ Schill. Although only one badly battered specimen was taken, this has been reported from drift both by Parshley and myself.

Aradus niger Stål.

Fitchia aptera Stål. These two species have not been before reported from drift; both were in the rare winged form, as already noted.

Lygus pratensis Linn. A very lively specimen of this species not before known from drift.

Acanthia sphacelata Uhler. One very lively specimen was found in the water. Parshley has reported it.

Micracanthia humilis Say. Three were found quite waterlogged; Parshley and myself have previously found it on the tide-line.

Ochterus banksi Barber. One very lively specimen gives the first record for this species in the surf.

For the purpose of arriving at some explanation of this phenomenon, the weather conditions were carefully noted. The day before, Friday, October 10, had been warm, humid and showery in the morning, clearing by afternoon, but the atmospheric condition continued. *Cyrtomenus mirabilis* being found the following morning at about 11 a. m. dead on clean sand away toward the water from any drift might seem to have been in flight on the day before. The 11th dawned bright and warm (70° at 9 a. m.), and warmed up as the day went on. Nothing was found floating in on the wash-up except a very few beetles and the *Lygus pratensis* noted. After noon, at about 3 o'clock, it began to grow a little cloudy, finally getting completely overcast by 8 p. m. and raining heavily. Insects were flying about in the morning, notably *Eristalis* and other hover flies and common Lepidoptera, none of which, however, was found on the tide line. Up to about 4 or so, the wind had blown in steadily and strongly from of the wet weather. The insects were taken on the edge of the advancing tide, which was coming in at about 5 p. m. The the sea, changing at that time to a land breeze with the coming greater part of them was taken between that hour and a little after six. These included both the *Acanthias, Ochterus, Thyreocoris, Geotomus, Aradus, Peribalus, Alydus, Nysius* and *Podisus*. The *Fitchia* was taken at about 4, the only bug on the stretch of beach at the Inlet, near the Absecon lighthouse. The poor condition of the *Podisus, Nysius* and *Alydus* might show that they had been in the water for some time.

What are the conditions that control these flights leading into the sea? We seem to have now in hand certain data on which to base a temporary explanation.

Needham says:[1] "After every on-shore breeze following sunshiny summer weather some insects are cast up by the waves and there is a great accumulation of them." It was under these conditions that he found large numbers of beetles on the shores of Lake Michigan.

In 1914 I noted[2] a heavy sea-breeze, raw and gusty, with warm weather inland. As I remember, it was a typical October day, with bright sun occasionally obscured by clouds. In 1913, I noted a windy day with occasional clouds, direction of the wind not observed.

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[1] 1904, "Beetle Drift on Lake Michigan," Can. Ent., XXXVI: 294–296.

[2] 1915, "Hemiptera in Beach Drift," Ent. News, XXVI: 274–279.

Of Parshley's three experiences[3] two were in midsummer and the other in June. Here again the breeze was on-shore with fair weather. In my collecting and Parshley's one less obvious fact appears: that the bugs were found in the afternoon.

Of course, the imagining of explanations for natural phenomena is a pleasing intellectual effort; and the explanation may or may not be true. In the present case we have eight factors.

1. On-shore wind.
2. Preceding fair, warm weather.
3. Bright sunshine.
4. Abundance of insects in the afternoon.
5. No nuptial flights.
6. Fair representation of insects but no great abundance of any one species.
7. Abundant wild vegetation back of the beach (not mentioned in other paper by myself).
8. Period of arrival at maturity of many species, or at height of number of mature insects.

Parshley's remark[4] that at such times "the ocean reflects the sunlight with a peculiar sparkling brilliancy" seems to me to be the key to the problem.

On the days under discussion the insects are moved to flight by the warmth of the atmosphere in the afternoon or late morning. These flights must be in the upper air, since the insects are not noticeable as to numbers while in flight. The bugs that travel against the wind go out to sea. Here, they either get tired and fall exhausted into the sea; or the intense and dazzling reflection of the sun from the ocean surface attracts them. The insects perceive it, and phototropism lures them to their doom. They fly toward this dazzling light, and are either exhausted by having to struggle against the wind, or naturally gravitate toward the source of light, there to perish.[5] The wind, being on-shore, propels the insects back to the beach, for, were it off-shore, it would blow the insects not in the range of the breakers out to sea.

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[3] 1917, "Insects in Beach Drift, I—Hemiptera Heteroptera," Can. Ent., XLIX: 45–48.

[4] Op. cit., 48.

[5] 1914, "Phototropism in Heteroptera," this Bulletin, IX: 90–96, J. R. de la Torre Bueno.

Or, to put it another way: On any day of sunshine and warmth, when insects are mature, they fall into bodies of water in their flights, either through exhaustion or lured thereto by the dazzling reflection of the sun. They are found most abundantly when the wind is off-shore, because it blows them in. The controlling factor for their fall into the water may be phototropism or weariness, or both.

This conclusion is substantially the same that Dr. Needham arrived at in his 1917 paper,[6] which has come to my notice after writing the preceding.

This phenomenon, of course, is one phase of that which leads to the finding of insects on shipboard at great distances from land.[7]

NOTES ON BEETLES OF THE GENERA MELASOMA AND GONIOCTENA.

By Wm. T. Davis, New Brighton, Staten Island, N. Y.

On June 13, 1914, Col. Wirt Robinson, Mr. Charles Schaeffer and the writer were on the top of Crow's Nest Mt., West Point, N. Y. On the northerly extension of the mountain we found a number of *Melasoma tremulæ* Fab. on the small poplars and willows growing in a depression in the otherwise generally rocky surface. On one of the willows we found *Melasoma interrupta* Fab. associated with *Melasoma tremulæ*. The writer discovered a male *interrupta* that was apparently in copulation with a female *tremulæ*, but as the insects had been disturbed we were not sure. They were, however, removed with a few of the willow leaves to a bottle, and on the evening of June 18 were found in copulation and examined with a glass to avoid any chance of error.

The *Melasoma interrupta* here mentioned is known as *Lina lapponica* Linn. in many collections, but in our native *interrupta* the sides of the thorax are light in color, whereas the *lapponica* of Europe has the thorax unicolorous, the same as in *tremulæ*. They, however, according to Crotch's table in the Proceedings of the Academy of Natural Sciences of Philadelphia, Vol XXV, p. 52, 1873, all belong to the same group being "Elongate, sides of thorax-thickened; claw-joint not dentate beneath." Crotch considered *interrupta* the same as *lapponica,* but this does not now appear to be the case.

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[6] 1917, "The Insect Drift of Lake Shores," Can. Ent., XLIX: 129–137. This has a bibliography of eight titles bearing on the subject.

[7] 1867, G. R. v. Frauenfeld, "Insectenleben zur See," K. K. Zool.-Bot. Ges. Wien, 1867, pp. 1–40 of separate.

The finding of a male and female of these two species in copulation in a state of nature, before they were confined in the bottle, is of much interest, and suggests an opportunity for future work in the genus *Melasoma.*

While *Melasoma interrupta* has long been known from a wide range of localities in the United States, *tremulæ* has apparently been spreading southward. Crotch says of the latter species in 1873, "it is very common in Europe, and has been sent from Hudson's Bay." The species was not mentioned in the second (1900) edition of the New Jersey List, but is recorded in that of 1910 from "Anglesea VI, 12, one specimen (Boerner)." The writer collected a single specimen at Newfoundland, N. J., July 6, 1907, and has also found it in the Adirondacks, June 22, and at West Point, N. Y., in June, 1912, and June, 1914. Other New York State specimens are from shore of Lake Ontario near Pulaski, Groton, Batavia, Honeoye Falls, Conesus Lake, and Rock City, Cattaraugus Co., all collected in June, and Queens, Long Island, without date. On Staten Island, N. Y., it has been collected at Watchogue, July 2, 1916. Also collected at Black Pond, Fairfax Co., Va., near the Potomac River, where two individuals were found June 21, 1914. In the collection of Mr. Charles W. Leng there are specimens from New Hampshire, and Aweme, Manitoba (N. Criddle).

As a matter of interesting distribution of a related species, the writer can record the capture of two specimens of *Gonioctena arctica* Mann., at Derrick City, Pa., near the N. Y. state line at Olean, Cattaraugus Co., on June 6, 1915. In the north it is more common and we have the species from Mt. Washington, N. H. In Mr. Leng's collection there are specimens from Sudbury, Ontario; Duluth, Minn., and Telegraph Creek, British Columbia.

A NEW GENUS OF AGROMYZIDÆ (DIPTERA).

By J. R. Malloch, Urbana, Ills.

The species described herein has been in my possession for four years, but I have delayed publication of the description as it was my intention to publish at the same time a key to the species of the genus *Agromyza* which have the knobs of the halteres black and the costa continued to apex of fourth vein. An examination of the specimens discloses the fact that the species may properly be removed to another genus and I therefore describe it as the type of a new genus.

The species of *Agromyza* with black halteres have recently been removed from *Agromyza* by Hendel. Those with a median facial keel are placed in *Ophiomyia* Braschnikow, with the genotype *curvipalpis* Zett., and those without a facial keel in *Melanagromyza* Hendel, with the genotype *æneiventris* Fallen. From both of these genera the one now described may be separated by its hairy frontal lunule.

It may be pertinent to note here that Hendel has indicated that *burgessi* Malloch is in his opinion a synonym of *æneiventris*. This is not so, but it is not at all improbable that *virens* Loew is as it runs down to *æneiventris* in Hendel's key while *burgessi* does not.

Limnoagromyza gen. n.

Generic characters: Similar to *Melanagromyza* Hendel, with black halteres and no presutural dorsocentral. The eyes are bare in both sexes, and there are some microscopic hairs on the frontal lunule which I have not seen in any other speceis of the old genus *Agromyza*.

Genotype, the following species.

Limnoagromyza diantheræ sp. n.

Male and female.—Glossy black. Interfrontalia opaque black; orbits, lunule, and face slightly pruinescent. Dorsum of thorax and abdomen with a slight bluish or greenish metallic tinge. Legs entirely black. Wings slightly suffused with brown, veins bark brown and conspicuous. Halteres black. Calyptræ and their fringes white. Ocelli in an almost equilateral triangle, the bristles long; each orbit with 4 or 5 bristles and, laterad of these, with dense short hairs which are not directed forward; ocellar triangle not extending beyond middle of frons; lunule almost transverse above, of moderate size; face shining in center, and with a slight median keel which separates antennæ at base; arista thickened at base, microscopically pubescent; vibrissal angle not produced; face receding below; cheek higher than width of third antennal segment and twice as high as width of parafacial at base of antennæ. Thorax with two pairs of dorsocentrals and sometimes a weak third pair; prescutellar acrostichals absent. Fifth abdominal tergite in both sexes not half as long as fourth, in female about as long as the short ovipositor. Mid tibia with two or three posterior setulæ. Apical sections of third and fourth wing-veins subparallel, their apices about equally distant from wing tip; inner cross-vein beyond middle of discal cell; penultimate section of fourth vein from one fourth to one sixth as long as ultimate and as long as outer cross-vein; ultimate section of fifth vein over half as long as penultimate. Length, 3.5–4 mm.

Type, female, and three female paratypes, Muncie, Ill., August 15, 1917 (Frison and Malloch). Allotype, Lafayette, Ind., June 11, 1915 (J. M. Aldrich). Paratypes, 5 specimens, Lafayette, Ind., June 2, one specimen, same locality, August 7, 4 specimens, same locality, June 10–18, 1915 (J. M. Aldrich); one specimen, No. 24401, data missing, but probably from an aquatic collection made in Illinois by Mr. Hart, the accession catalogue of which is missing.

The larvae mine the stems of *Dianthera americana* along the margins of streams.

BOOK NOTES.

The one thought always with us is that the growing generation of today must fill the ranks of the entomologists of tomorrow. It is in these children that an intelligent love of nature must be fostered. As we have said before, every entomologist at one time or another is asked to suggest something likely to interest children in insects. Dr. Edith M. Patch needs no introduction to entomologists. Her new book for the youngsters **"A Little Gateway to Science"** (Atlantic Monthly Press, Boston; 90 cents) I can recommend for youngsters under ten, for I have tried it on three of mine with great success. Under the guise of fairy tales, Dr. Patch tells the life-history of *Euvanessa antiopa, Bombus, Cecidomyia strobiloides, Papilio polyxenes, Enchenopa binotata, Plathemis lydia, Photinus pyralis, Dissosteira carolina, Meloë angusticollis, Gryllus, Actias luna* and *Oiketicus abbottii.*

The Scutelleroidea of Iowa, by Prof. Dayton Stoner of the University of Iowa, No. 4, Vol. VIII, of *University of Iowa Studies in Natural History,* is a very useful manual. It brings together under one cover much information widely scattered through many publications. It has keys to families, subfamilies, tribes, genera and species, with concise descriptions of each, range, foodplant and habits where known. It also carries 7 plates of structural details and an extensive bibliography on the American species of the family. It might seem as though tables for all American genera and species of the group could have been prepared with but little more labor and the work thus made of greater and wider use. It is of convenient size and well printed. As an introduction to the study of the group known variously as Pentatomoidea, Cimicoidea or Scutelleroidea, students starting out in the study of the Hemiptera will find this work of Dr. Stoner's very useful.

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BULLETIN
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Vol. XVI FEBRUARY, 1921 No. 1

THE COMPARATIVE MORPHOLOGY OF THE MALE GENITALIA OF THE LEPIDOPTEROUS FAMILY HEPIALIDÆ.

By John R. Eyer, State College, Pa.

Introduction.

The male genitalia of Lepidoptera have long been a subject of study by both the insect morphologist and the systematic entomologist. As a result of this study two complete systems[1] of nomenclature have arisen for the sclerites and appendages comprising this organ.

The morphologist, interested primarily in homologies, has formulated a system based on the somatic structure of insects and equally applicable to all orders of the Hexapoda. The most prominent investigators of this problem from a morphological standpoint are Burmeister, Kolbe, Peytoureau and Berlese. A. G. Newell, Annals of the Entomological Society of America, June, 1918, has carefully homologized the morphological systems of terminology throughout all the main orders of insects.

The taxonomist, interested particularly in the discovery of specialized structures to serve as criteria for the differentiation of genera and species, has originated a descriptive terminology based on the structure and position of the particular part designated, applicable only to Lepidoptera and often restricted to that family or group in which the investigator specialized. F. N. Pierce, a British lepidopterist, has probably contributed more to our knowledge of the systematic value of Lepidopterous genitalia than any other author. The systematic schema of terminology is adapted from his two works, "The Genitalia of the Noctuidæ" and "The Genitalia of the Geometridæ."

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[1] A third system of nomenclature used by European writers with reference to the Apterygotoid, Neuropteroid and Orthopteroid forms has been homologized by G. C. Crampton, Bulletin Brooklyn Entomological Society, 1918, and is not discussed in this paper.

The primary object of this paper is to homologize these two systems of nomenclature by a comparative study of the most primitive family of the order Lepidoptera, namely the Hepialidæ.

The male genitalia of many Neuropteroids, Trichoptera and all available families of Lepidoptera have been examined in connection with the preparation of this paper, but only the Hepialidæ are figured, for they best accomplish this purpose.

TERMINOLOGY

The abdomen of the typical lepidopteron consists of eleven segments designated by the morphologist as somites, the dorsal chitinized portion being called the tergum and the ventral chitinized portion, the sternum. The genitalia proper are formed by the telescoping and anastomosing of the last four abdominal somites (8, 9, 10, 11) accompanied by a structural modification of their respective appendages (I, II, III, IV) according to function. In the Hepialidæ this telescoping has taken place to a much less extent than in any other of the Lepidopterous families, the somites retaining a more generalized condition in regard to the shape of their terga and sterna and the relative positions of their respective appendages.

In all higher Lepidoptera, somites 1–7 possess a pair of spiracles located on the lateral margins of the sternum; in the Hepialidæ somite 8 also retains a well-developed pair of spiracles.

Those structures constituting the genitalia proper may be described and homologized as follows (see Fig. 1):

SOMITE 8:

Tergum: A simple unmodified chitinous plate.

Sternum: A small rectangular ventro-cephalic plate and a broader curved, invaginated V- or U-shaped portion, the Vinculum of systematists, formed by a pocketing in of the caudal margin of this sclerite.

Appendage I: A pair of finger-like processes, the Harps of Pierce, associated superficially with the ninth sternum, as in the case of all Lepidoptera, but attached laterally and ventrally to the lateral margin of the eighth sternum, thus showing their relation to it.

In the systematic terminology of Pierce, the basal inner portion of this appendage is termed the Sacculus and the outer free lobe, the Valva. In the Hepialidæ the Harps are so little differentiated that this terminology is scarcely applicable. The term Claspers has been loosely applied to these appendages but this term should be strictly confined to specialized structures described by Pierce on the inner surface of the Harp. These, as well as other structures belonging to the Harp, which are so characteristic of higher Lepidopterous genitalia, do not occur in the Hepialidæ.

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SOMITE 9:

Tergum: Heavily chitinized, deeply emarginate or divided on the meson and forming the dorsal hood-like portion of the genitalia. This is called the tegumen by Pierce and together with the anastomosed eighth and ninth sterna is referred to as the tegumenal ring. The tegumen and vinculum together with the Gnathos and Uncus are known as the external part of the male genitalia.

Sternum: A simple chitinized plate situated beneath appendage I but only superficially connected with it. Sternum 9 in the higher Lepidoptera forms the basal portion of the penis and is known as the Anellus while its appendage (Appendage II) together with the appendage of somite 10 (Appendage III) form the remainder of the chitinous sheath through which the penis opens and is designated the Ædœagus by Pierce. The basal part of the Anellus is often modified into a chitinized spinous or scobinate plate, the Juxta. In the Hepialidæ, however, somite 9 possesses no appendage, and the penis, a membraneous internal structure passes behind sternum 9 and opens caudad to sternum 10.

SOMITE 10:

Tergum A divided sclerite interrupted dorsally by the opening of the anus and crowded out of position by the enormous tergum 9. Ventrally the two portions of this sclerite are united to the small, square, tenth sternum. In the higher Lepidoptera, tergum 10 is often produced above the anus into a dorsal hood or hook, the Uncus of Pierce.

Sternum: A small square or rectangular sclerite, ventrad to the anus, simple in the genera *Pielus* and *Gorgopis* but in *Hepialus* and *Stenopis* possessing a spatulate, median appendage, articulated by an elbow joint and probably serving as an intromittent organ for the penis which opens just behind it. Sternum 10 is plainly homologous with the Gnathos or Subscaphium of Pierce as its position ventrad to the anus would indicate. Whether its appendage, in *Hepialus* and *Sthenopis* is homologous with appendage III, the distal part of the Ædœagus, is rather questionable and its occurence is too inconstant to substantiate any definite conclusion. Its function, however, is undoubtedly the same as that of the Ædœagus of the higher Lepidoptera.

SOMITE 11: Tergum and sternum 11 are not developed in this family except in the genus *Gorgopis* having been supressed by the invagination of the anus within tergum 9. In *Gorgopis* tergum 11 is well developed forming a hood-like Scaphium covering the anus dorsally and laterally.

The Cerci which are regarded as appendages of somite 11 (Appendage IV) are lacking. In the genera *Gorgopis* and *Pielus* tergum 9 bears a pair of small chitinous processes caudad to the first pair found in all the genera examined, and dorsad to the anus, a position suggestive of Cerci, but their structure and articulation would indicate that they are only a secondary pair of processes.

In the higher Lepidoptera there is a pair of appendages laterad to the Uncus and attached to tergum 9. These are called Socii and are probably homologous with the Cerci although it is barely possible that they are structures developed independently within the order Lepidoptera and in no way homologous with the Cerci of the Neuropteroid and Orthoperoid insects.

DISCUSSION.

A brief resumé of those genera of the Hepialidæ which were studied will serve to contrast their respective characteristics as well as to emphasize the generalized condition of the male genitalia in this family.

Hepialus.

This genus seems to be the most primitive of those studied. Sternum 8 is only slightly invaginated, forming a broad U-shaped Vinculum, while the greater portion of it remains typical in shape and position. Sternum 9 is a broad, pentagonal sclerite closely associated with the Harps and only slightly fused with sternum 8. Tergum 9 is a simple hood-like sclerite forming the dorsal wall of the Tegumen and bearing a small pair of chitinous processes on its ventral margin. Sternum 10 is a small square sclerite bearing a median process (Appendage III) functioning as an intromittent organ and foreshadowing the Ædœagus of higher forms. The Ductus Ejaculatorius opens caudad to sternum 10 just beneath appendage III. Tergum 10 consists of two small sclerites laterodorsad to sternum 10 and articulating laterally with tergum 9. Sternum and tergum 11 are absent. Species examined: *Hepialus lupulinus* L. and *H. gracilis* Grt. (Fig. 2).

Sthenopis.

This genus resembles *Hepialus* quite closely in its main structural features. Sternum 8 is more deeply invaginated, the caudad margin strongly emarginate around the Vinculum and the lateral and cephalic margins of the sclerite are indistinct. The fusion of sternum and tergum 10 with appendage III is more marked and the resulting structure forms a suspensorium articulated laterally to tergum 9. The Ductus Ejaculatorius which opens between the arms of this suspensorium and appendage III is attenuated into a triangular process. The chitinous processes of tergum 9 are longer and more spinous than in *Hepialus* and are differentiated into a primary and a secondary pair. Species examined: *Sthenopis humuli* and *S. thuli* L. (Fig. 3).

Gorgopis.

In this genus the fusion of terga 9 and 10 with the chitinous processes of tergum 9 has resulted in the formation of two large lobate processes located on either side of the opening of the Ductus Ejaculatorius and attached basally to tergum 9, leaving sternum 10 as a small isolated sclerite in the conjunctiva caudad to sternum 9. The probable function is as an intromittent organ. Tergum 9 is enlarged into a dorsal hood surrounding the base of the anus and bears a small pair of secondary chitinous processes on its inner dorsal margin. The preservation of tergum 11 in this genus has been previously discussed. It is figured as a hood-like structure with well chitinized lateral margin dorsad to the anus. Species examined: an undetermined species in the Cornell University collection (Fig. 4).

Pielus.

This genus presents the extreme of specialization by fusion. The Vinculum is large, heavily chitinized and completely isolated from the remaining uninvaginated portion of sternum 8 but situated dorsad to it. Sternum 9 is heavily chitinized, firmly attached to the Vinculum by conjuctiva and bears on its lateral margin a small pair of Harps. Tergum 9 is enormously enlarged, heavily chitinized and bears a primary and secondary pair of processes. Sternum and tergum 10 are small and firmly articulated to tergum 9. Appendage III is lost through the approximation of sternum 10 and the primary processes of tergum 9. These latter probably function as the intromittent organ. The opening of the Ductus Ejaculatorius is just caudad to sternum 10 and dorsad to these processes (Fig. 5). Species examined: *Pielus labyrinthicus.*

SUMMARY

By careful comparison it has been found possible to homologize the taxonomic terminology of Pierce and other systematists with

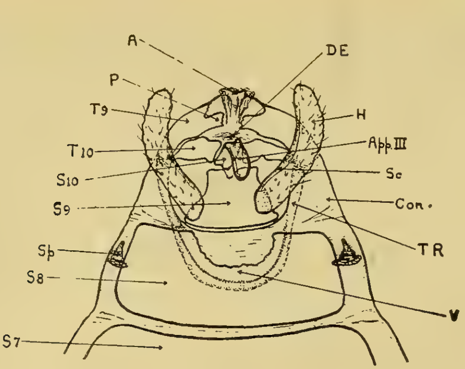
A
DE
P
H
T9
App. III
T10
S10
Sc
S9
Con.
TR
Sp
S8
V
S7

Fig. 1

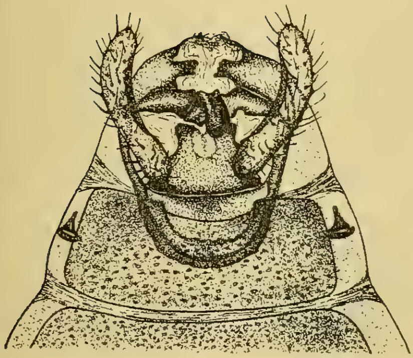

Fig. 2

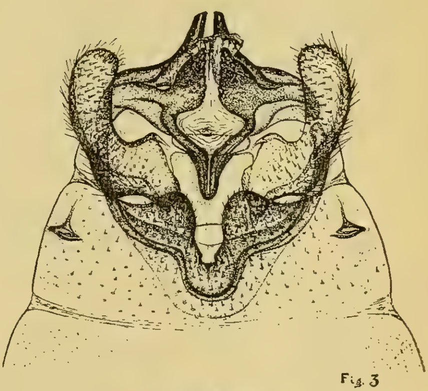

Fig. 3

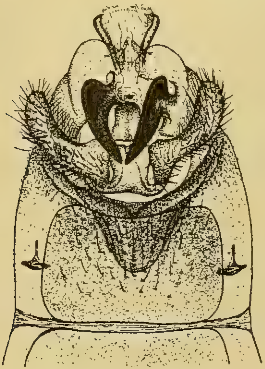

Fig 4

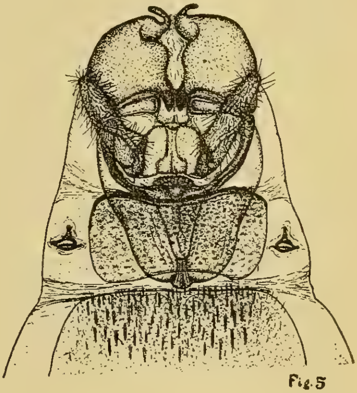

Fig. 5

PLATE I.
Genitalia of Hepialidæ—J. E. Eyer del.

those morphological units comprising the male genitalia of adult Lepidoptera. The male genitalia of the family Hepialidæ have proved most helpful in accomplishing this because they have retained the primitive relation of the somites and their respective appendages. The absence of a true Ædœagus, the various modifications of somite 10 and appendage III to function as an intromittent organ, the association of the Harpes (App. I) with sternum 9 and the retention of the eighth abdominal spiracle are the most striking features in the morphology of the male genitalia of this family.

ACKNOWLEDGMENTS.

The author desires to thank Drs. J. Chester Bradley and Wm. T. M. Forbes for the loan of specimens from the Cornell University collection, Mr. Geo. P. Engelhardt for specimens of *H. gracilis* and Dr. Forbes and Mr. Carl Heinrich for their generous assistance in homologizing the parts of the male genitalia.

EXPANATION OF PLATE.

Abbreviations.

S7—Sternum 7.
S8—Sternum 8.
V—Vinculum.
Sp—Spiracle of Somite 8.
Con—Conjunctiva.
S9—Sternum 9.
T.R.—Tegumenal Ring.
Sc—Sacculus of Harpe.
App III—Appendage of Somite 10.
S10—Sternum 10.
T10—Tergum 10.
D.E.—Opening of Ductus Ejaculatorius.
P—Chitinous Process.
T9—Tergum 9.
A—Anus.

Figures.

FIG. 1. Male Genitalia of *Hepialus lupulinus* L., ventral aspect; parts spread and labeled.
FIG. 2. *Hepialus lupulinus* L.
FIG. 3. *Sthenopis humuli.*
FIG. 4. *Gorgopis* sp.
FIG. 5. *Pielus labyrinthicus.*

UNDESCRIBED OR LITTLE-KNOWN CRANE-FLIES FROM THE PACIFIC ISLANDS (TIPULIDÆ, DIPTERA).

By Charles P. Alexander, Urbana, Illinois.

Through the kindness of Prof. R. W. Doane and Mr. F. R. Cole, the writer was able to examine the crane-flies collected by Prof. Doane in Tahiti in 1908, in Samoa in 1913, and by Prof. V. L. Kellogg in the latter island in 1902. The result of this study has considerably extended our rather scanty knowledge of the Tipulidæ of oceanic islands although the main features of distribution are unmodified. The writer wishes to thank Prof. Doane and Mr. Cole for the privilege of studying this material. The types have been returned to Prof. Doane.

Libnotes perkinsi (Grimshaw).

Tahiti, August, 1908 (R. W. Doane); ♂.

Samoa, Apia, June–July 1913 (R. W. Doane); one small ♂.

This beautiful crane-fly was hitherto known only from Hawaii.

Libnotes samoensis sp. n.

General coloration shiny reddish brown; head silvery white with a dark brown vertical mark; femora pale brown with a broad, dark brown subterminal ring; wings subhyaline, the stigma dark brown; in the male cell *1st* R_1 suffused with brown; *Rs* short, straight; cell *1st* M_2 closed.

Male.—Length 7.5 mm.; wing, 9.8 mm.

Female.—Length 6.8 mm.; wing, 8 mm.

Rostrum and palpi dark brown. Antennæ with the scapal segments pale brown, the flagellum dark brown; flagellar segments elongate-cylindrical. Head with a pale silvery pubescence, clearest on the anterior part of the vertex; vertex with a conspicuous dark brown median mark, the sides less conspicuously darkened.

Mesonotum shiny reddish brown, the lateral præscutal stripes rather distinct, continued across the suture and suffusing the scutal lobes; scutellum and median area of the scutum pale; postnotum brown, paler basally. Pleura dull yellow, darker dorsally. Halteres brown, the base of the stem paler. Legs with the coxæ pale brownish yellow; trochanters dull yellow; femora pale brown with a broad, dark brown ring before the slightly narrower yellowish tip; tibiæ and tarsi brown, the apical segments of the latter darker. Wings subhyaline, the veins suffused with pale brown, darkest at the stigma where it occurs as a semicircular mark; a dark cloud beyond *Rs* in cells *Sc* and *1st* R_1; veins dark brown, *C* and *Sc* more yellowish. Venation: *Sc* ending just before the fork of the short, slightly convex sector, Sc_2 at the tip of Sc_1; *Rs* about twice the deflection of R_{4+5}; R_1 with a long spur beyond *r* and the tip of R_1; *r–m* a little shorter than the basal deflection of R_{4+5}; veins R_{2+3} and R_{4+5} deflected strongly caudad at about two thirds their length and running generally parallel to one another; basal deflection of Cu_1 near midlength of the rectangular cell *1st* M_2. In the female the only distinct marking on the wing is the conspicuous, rounded, brown stigma; the spur at the end of R_1 is shorter and *m* is more arcuated.

Abdominal tergites obscure brownish, the basal sternites bright yellow. In the female the tergites are dark brown, possibly discolored. Ovipositor with the valves rather short, the tergal valves slightly upcurved.

Habitat.—Samoa.

Holotype, ♂, Apia, June, July, 1913 (R. W. Doane); *Allotopotype,* ♀.

It now seems very probable that the fly described as *Teucholabis fijiensis* Alexander (Ann. Ent. Soc. America, Vol. 7, p. 240; 1914) is not a true *Teucholabis* and is possibly more nearly related to *Libnotes.*

Rhipidia tusitala sp. n.

General coloration pale yellow; head grey; antennal segments produced into flattened disks whose margins are provided with stout spinous bristles; wings pale yellow, veins *C* and *R* incrassated; *Sc* short, cell R_1 very large and oval due to the strong bending of vein R_{2+3} toward R_{4+5} near its base.

Male.—Length about 5.6 mm.; wing, 7.5 mm.

Rostrum and palpi dark brown. Antennæ pale brownish yellow, 14-segmented, the basal segment elongate-cylindrical; ultimate segment formed by the evident fusion of two smaller segments; intermediate flagellar segments with the inner face strongly produced into a serration; around the periphery of these disk-like segments are a series of about six stout, spinous bristles of which three are grouped near the tip of the serration; surface of the flagellar segments microscopically alutaceous. Head light gray.

Mesonotum light yellow, the postnotum more whitish. Pleura pale whitish yellow. Halteres pale. Legs pale yellow, the distal tarsal segments brown; claws toothed. Wings pale yellowish subhyaline; veins yellow. Venation: Costa and radius before the sector considerably incrassated, with numerous stout macrotrichiæ; *Sc* rather short, ending a distance before the origin of *Rs* that is about equal to *Rs* and the basal deflection of R_{4+5} combined; tip of R_1 atrophied, indicated only by a spur on costa, the macrotrichiæ of R_1 continued onto *r* for most of its length; *Rs* short, almost straight, about one half longer than the basal deflection of R_{4+5}; *r* long, arcuated, inserted on R_{2+3} about its own length before the tip; cell R_1 is very much enlarged, elongate-oval in outline; vein R_{2+3} is bent strongly toward R_{4+5} beyond its origin; *r–m* very short; cell *1st* M_2 closed, about as long as vein M_{1+2} beyond it; basal deflection of Cu_1 just beyond the fork of *M*; anal angle rather prominent. Veins *M, Cu, 1st A* and *2nd A* proximad of the cord destitute of macrotrichiæ or nearly so.

Abdomen pale yellow, the caudal margins of the segments narrowly brown. Male hypopygium with the two appendages nearly as long as the pleurites, the ventral pleural appendage fleshy, cylindrical, the tip produced slightly cephalad or proximad; dorsal pleural appendage curved slightly near the tip.

Habitat.—Samoa.

Holotype, ♂, Apia, June–July, 1913 (R. W. Doane).

This curious fly is not a typical member of the genus *Rhipidia* but from the unique structure of the antennæ it is placed in this group, at least provisionally. It is named in honor of the memory of Robert Louis Stevenson, "Tusitala," who spent the last few years of his life in Samoa and is buried near the type-locality. *R. debeauforti* (Meijere) is another member of this group.

Doaneomyia gen. n.

Related to *Dicranomyia* but distinguished from this genus as well as all others in the family Tipulidæ by the presence of a single anal vein. Antennæ 14-segmented. Tibiæ without spurs; claws long, simple, almost straight. Vein *Sc* is short, with Sc_2 not far removed from the tip of Sc_1; *Rs* and the basal deflection of R_{4+5} in alignment and subequal; cell *1st* M_2 open by the atrophy of the outer deflection of M_3; only the *1st Anal* vein preserved; no vestige of the atrophied vein immediately behind vein *Cu*; a long basal wing-petiole.

Genotype.—*Doaneomyia tahitiensis* sp. n. (Australasian Region).

Doaneomyia tahitiensis sp. n.

General coloration reddish brown; antennæ dark brown; legs brown, the tibiæ and tarsi variegated with pure white; wings subhyaline; stigma small, dark brown, cell *1st* M_2 open; a single anal vein.

Male.—Wing, 6–6.4 mm.

Rostrum pale brown; palpi dark brown. Antennæ dark brown; flagellar segments long-oval, densely white pubescent, verticils moderately elongated. Head dark brown.

Mesonotum reddish brown, darker medially, brighter laterally. Pleura pale reddish yellow. Halteres dark brown. Legs with the coxæ and trochanters yellow; femora pale brown; tibiæ dark brown, the moderately narrow base and the broad (about twice the base) apex pure snowy white; tarsi pure white, the basal two fifths of the metatarsus beyond the extreme base infuscated. Wings subhyaline; stigma small, oval, dark brown; veins dark brownish black. Venation: Sc rather short, Sc_1 ending a short distance before the origin of Rs, Sc_1 about three times the length of Sc_2; Rs but little longer than the basal deflection of R_{4+5}; r and the tip of R_1 indistinct; cell *1st* M_2 open by the atrophy of M_3; cell *2nd* M_2 about one-half longer than its petiole; basal deflection of Cu_1 just before the fork of M; basal deflection of Cu_1 equal to or a little longer than Cu_2; a single anal vein; the atrophied vein that lies behind Cu in many Tipulidæ is here entirely lacking.

Abdomen dark brown, the incisures paler. Male hypopygium with the dorsal appendage strongly curved; gonapophyses appearing as flattened plates.

Habitat.—Tahiti.

Holotype, ♂, August, 1908 (R. W. Doane). *Paratopotype,* Sex?.

The paratype is merely a fragment but unquestionably belongs to this species. It is with great pleasure that this curious genus is dedicated to Prof. Doane.

Trentepohlia (Mongoma) samoensis sp. n.

General coloration dark brown; legs brown, the tips of the femora and tibiæ narrowly white; tarsi pale brown; wings dusky grey.

Male.—Length 7.5–8 mm.; wing, 7.5–9 mm. *Female.*—Length about 9 mm.; wing, 8.5 mm.

Mouthparts yellowish; palpi dark brown. Antennæ dark brown. Head dark brown.

Mesonotum shiny dark brown, only the median area of the scutum, and the scutellum paler. Pleura pale brown. Halteres dark brown, the base of the stem paler. Legs with the coxæ and trochanters pale brown; femora pale brown, the tips narrowly (1 mm.) creamy-white; tibiæ brown, the extreme bases creamy, the tips passing into whitish (1.5–1.7 mm.); tarsi pale brown throughout; fore femora with a series of about five long bristles near the base. Wings with a strong dusky grey tinge, the costal and subcostal cells more brownish; stigma elongate oval, dark brown; wing-tip slightly infuscated; veins dark brown. Venation: Sc_2 not far from the tip of Sc_1, the distance between Sc_2 and *r* being a little less than the tip of R_1 beyond *r*; *2nd A* almost straight beyond the base.

Abdomen dark brown, the sternites and hypopygium a little paler.

Habitat.—Samoa.

Holotype, ♂, Apia, June–July, 1913 (R. W. Doane); *Allotopotype*, ♀; *Paratopotypes*, 10 ♂'s (R. W. Doane); 1 ♂, July, 1902 (V. L. Kellogg).

Trentepohlia (Mongoma) pacifica sp. n.

Female.—Length about 6.8 mm.; wing, 6.2 mm.; fore leg, femur, 9.4 mm.; tibia, 9.5 mm.

Similar to *T.* (*M.*) *samoensis* but much smaller; mesonotum light reddish yellow; legs pale brown, the tips of the femora rather broadly (1.5 mm.) pure white; tibiæ brown, the extreme base and the broad tips (2 mm.) white; tarsi pure white, only the distal segments brownish; wings nearly hyaline, including the costal cell; stigma pale brown; Sc_2 much closer to the tip of Sc_1; basal deflection of Cu_1 a short distance before the fork of *M.*

Habitat.—Samoa.

Holotype, ♀, Apia, June–July, 1913 (R. W. Doane); *Paratopotype*, ♀.

Styringomyia didyma Grimshaw.

Tahiti, August, 1908 (R. W. Doane); a few ♂ ♀.

TWO SEASON'S COLLECTING OF APHIDÆ, PRINCIPALLY ON LONG ISLAND, NEW YORK, WITH NOTES ON SOME OF THE SPECIES.

By Chris E. Olsen, West Nyack, N. Y.

The Alphidæ listed below were all collected by the writer and represent two seasons' attention to this group. The material was gathered with the intention of building up a study collection but, after making an earnest effort it was abandoned, through lack of time to prepare material, for other groups in the Homoptera requiring less time to prepare. One that has tried to work on this family can well appreciate what others have accomplished. These few words may be considered a modest apology for printing a mere list with so few comments.

The writer is much indebted to Miss Edith M. Patch of the Maine Agricultural Experiment Station, Orono, Maine, and to Mr. John June Davis, then at the United States Entomological Laboratory, West La Fayette, Indiana, and wishes here to express his appreciation for their willing and unfailing assistance in determining the material, as well as to Mr. Norman Taylor of the Brooklyn Botanical Garden for his kind determination of the food plants. Credit must be given to Miss Dorothy Olsen for the tedious work of copying the labels and compiling the list.

With few exceptions, the slides have all been deposited with the American Museum of Natural History. The comments on the food habits are based largely on the recent work by Wilson and Viccory, Trans. Wis. Acad. Sci. Arts and Letters, Vol. XIX, Pt. I, pp. 22–355, 1918. The asterisk (*) indicates new specifically determined food plants.

Macrosiphum taraxaci Kaltenbach.

Maspeth, N. Y., VI, 27, 1914, on *Taraxacum officinale.*

There seems to be very little in American literature concerning this dandelion aphid. I have seen no record of its being taken in New York State.

Macrosiphum pisi Kaltenbach.

Wading River, N. Y., V, 30, 1913, on *Medicago lupulina,** The pea aphid, a destructive and cosmopolitan species, with a long list of food plants to which the above mentioned plant is an addition.

Macrosiphum œnotheræ Williams.

Honesdale, Pa., IX, 23, 1913, on *Œnothera biennis.*

Macrosiphum illinoisensis Shimer.

Maspeth, N. Y., VI, 25, 1913, and VII, 13, 1914, on grape vine.

Macrosiphum rudbeckiæ Fitch.

Maspeth, N. Y., VI, 28, 1914, on *Silene noctiflora;** X, 16, 1914, on *cultivated aster;* VII, 12, 1913, on *Solidago* sp.; IX, 1, 1913, on *Lactuca* sp.; IX, 1, 1913, on *Xanthium canadensis;* IX, 4, 1914, on *Rudbeckia laciniata;* IX, 7, 1913. on cultivated lettuce.

Wading River, N. Y., V, 30, 1913, on *Antennaria neodioica.**

Honesdale, Pa., IX, 26, 1913, on *Artemisia* sp., and on *Anaphalis margaritacea.**

Rockaway Beach, N. Y., VII, 26, 1914, on *Solidago* sp.

Although it has a long and varied list of food plants, these records seem to increase the list by at least four species

Macrosiphum sanborni Gillette.

Maspeth, N. Y., VII, 13, 1914, and VII, 18, 1914, on chrysanthemum.

Macrosiphum rosæ Linnaeus.

Maspeth, N. Y., VII, 18, 1914, on rambler rose.

Macrosiphum sp.

Wading River, N. Y., V, 30, 1913, on high-water scrub, *Iva frutescens.*

Macrosiphum sp.

Maspeth, N. Y., V, 28, 1914, on *Silene noctiflora.*

Drepanaphis acerifoliæ Thomas.

Maspeth, N. Y., X, 26, 1914, and VI, 25, 1913, on maple (*Acer saccharinum*).

Phorodon galeopsidia Passerini.

Maspeth, N. Y., VI, 24, 1913, VIII, 24, 1913, and VIII, 2, 1914, on *Polygonum* sp.

Phorodon inulæ Passerini.

Honesdale, Pa., IX, 26, 1913, on *Inula helenium* L.*

This adds one more species of *Inula* to its list of food plants.

Siphocoryne pastinacæ Linnæus (=*S. xylostei* Schrank).

Maspeth, N. Y., XI, 1, 1914, on *Lonicera japonica.*

Siphocoryne angelicæ Del Guercio.

Maspeth, N. Y., VIII, 23, 1913, on *Artemisia absinthium.*

I found this species on a single worm-wood plant in my garden in such great numbers as to do considerable damage both by feeding and by secretion of honey dew, almost destroying the plant before it drew my attention.

Siphocoryne capreæ Fabricius.

Maspeth, N. Y., VII, 18, 1914, on cultivated parsnips.

Cerosipha rubifolii Thomas.

Maspeth, N. Y., VI, 28, 1914, on *Rubus* sp.

Myzus cerasi Fabricius.

Wading River, N. Y., V, 30, 1913, on cherry seedlings.

Myzus persicæ Sulzer.

Maspeth, N. Y., X, 26, 1914, and XI, 1, 1914, on *Prunus serotina;* XI, 7, 1913, on cultivated radish; X, 15, 1914, on kohlrabi.

Winfield, N. Y., XI, 14, 1914, on *Chenopodium* sp.

It may be interesting to know that Wilson and Vicory, in their recent list, have compiled one hundred and seventy-four species of food plants for this Aphid.

Myzus fragæfolii Cockerell.

Maspeth, N. Y., VI, 13, 1914, on *Fragaria virginiana.**

There has been no definitely determined food plant previously given for this species.

Hyalopterus arundinis Fabricius.

Maspeth, N. Y., XI, 1, 1914, on *Prunus serotina.**

It has been cited as feeding on five other species of *Prunus* besides species of genera more or less remote from this.

Aphis rumicis Linnæus.

Maspeth, N. Y., VI, 13, 1914, on *Arctium lappa;* X, 29, 1914, on *Chenopodium* sp.

Aphis forbesi Weed.

Maspeth, N. Y., VI, 13, 1914, on *Fragaria virginiana.**

This was found abundantly scattered in a strawberry patch in common with *Myzus fragæfolii* Cockerell. The above record establishes a specifically determined food plant for this species as well. Both species had previoulsy only been cited on *Fragaria* sp.

Aphis gossypii Glover.

Maspeth, N. Y., X, 26, 1914, on *Hisbiscus syriacus.**

Reported as taken on a long list of food plants including *Hibiscus* species, but no mention is made of *H. syriacus.*

Aphis viburnicola Gillette.

Maspeth, N. Y., VI, 21, 1914, on *Viburnum* sp.

Aphis urticæ Fabricius.

Honesdale, Pa., IX, 26, 1913, on *Urtica gracilis.**

This makes a third species of food plant in the genus *Urtica.*

Aphis bakeri Cowen.

Honesdale, Pa., IX, 23, 1913, on apple.

Aphis coreopidis Thomas.

Maspeth, N. Y., VIII, 2, 1914, on *Bidens frondosa.*

Honesdale, Pa., IX, 28, 1913, on *Bidens* sp.

Aphis atriplicis Linnæus.

Maspeth, N. Y., VII, 17, 1913, and VIII, 2, 1914, on *Chenopodium album.*

Aphis cephalanthi Thomas.

Wading River, N. Y., V, 30, 1913, on *Cephalanthus occidentalis.*

Aphis pomi De Geer.

Wading River, N. Y., V, 30, 1913, on apple seedling.

Aphis lutescens Monell.

Winfield, N. Y., VI, 8, 1913, in *Asclepias cornuta.**

Three other species of *Asclepias* are mentioned as food plants for this aphid.

Aphis maidis Fitch.

Maspeth, N. Y., VIII, 24, 1913, on *Syntherisma sanguinea;* VIII, 24, 1913, on *Chæochloa glauca;* VIII, 24, 1913, on *Echinochloa crus-galli.*

Aphis helianthi Monell.

Blissville, N. Y., X, 17, 1914, and IX, 6, 1913, on *Helianthus rigidus.**

A general feeder on the sunflower, this makes the eighth species of *Helianthi* that it is known to attack.

Aphis brassicæ Linnæus.

Maspeth, N. Y., IX, 17, 1913, on cultivated radish.

Aphis sanborni Patch.

Maspeth, N. Y., V, 20, 1914, on *Sambucus canadensis*.*

This species has heretofore only been known to occur on *Ribes* sp. This new food plant record has been questioned. It would be of interest to have it corroborated.

Aphis setariæ Thomas.

Maspeth, N. Y., IX, 19, 1914, on *Digitaria sanguinalis*.

Chaitophorus sp.

Honesdale, Pa., X, 3, 1913, on *Salix sericea*.

Chaitophorus populicola Thomas.

Maspeth, N. Y., IX, 7, 1913, on *Populus* sp.

Myzocallis discolor Monell.

Maspeth, N. Y., X, 26, 1914, on *Quercus prinus*.*

This is known to occur on two other species of oak.

Calaphis betulæcolens Fitch.

Honesdale, Pa., X, 3, 1913, IX, 23, 1913, IX, 28, 1913, and IX, 10, 1915, on *Betula lutea*.*

This makes a third species of *Betula* recorded as its food plant.

Euceraphis betulæ Koch.

Honesdale, Pa., X, 3, 1913; IX, 23, 1913; IX, 28, 1913; IX, 27, 1915; White Plains, N. Y., IX, 27, 1914; all on *Betula lutea*.*

This records another species of *Betula* to its list of food plants, as well as an interesting record of distribution for this European introduction. Elsewhere in the United States there have been few other localities mentioned.

Myzocallis bella Walsh.

White plains, N. Y., IX, 27, 1914, and Kissena Lake, Flushing, N. Y., X, 4, 1914, on *Quercus rubra*.

Lachnus strobi Fitch.

Wading River .N Y., V, 30, 1913, on pine.

Eriosoma americana Riley.

Winfield, N. Y., VI, 8, 1913, and Maspeth, N. Y., VI, 14, 1914, on elm.

Eriosoma lanuginosa Hartig.
Winfield, N. Y., VI, 27, 1914, and VI, 15, 1914; Maspeth, N. Y., VII, 19, 1914, on elm.

Eriosoma lanigera Hausman.
Honesdale Pa., IX, 23, 1913, on apple; IX, 23, 1913, on *Cratægus* sp.; Maspeth, N. Y., VII, 19, 1914, on apple.

Tetraneura ulmisacculi Patch.
Maspeth, N. Y., VI, 28, 1914, on elm.

Tetraneura graminis Monell.
Winfield, N. Y., VI, 8, 1913; Maspeth, N. Y., VI, 25, 1913, and VI, 14, 1914; on elm.

Hormaphis hamamelidis Fitch.
Wading River N. Y., V, 30, 1913 and 1914, on *Hamamelis virginiana*.

Pemphigus rhois Fitch.
Honesdale, Pa., X, 3, 1913, on *Rhus* sp. (sumach).

Forda occidentalis Hart.
Maspeth, N. Y., VI, 21, 1913, on *Polygonum* roots.

Rhopalosiphum hippophaes Kaltenbach.
Maspeth, N. Y., IX, 19, 1914, on *Polygonum pennsylvanicum*.*

A third species of *Polygonum* to be cited as food plant.

Pterocomma smithiæ Monell.
Wading River, N. Y., V, 30, 1914, on *Salix fragilis*.*
Winfield, N. Y., X, 12, 1914, on willow.

This is a third *Salix* sp. added to the list.

THE MONTANDON COLLECTION OF GEOCORINÆ (LYGÆIDÆ, HEMIPTERA).

By H. M. Parshley, Smith College, Northampton, Mass.

The eminent Rumanian hemipterist, Professor A. L. Montandon, has long been recognized as the principal authority on the Lygæid subfamily Geocorinæ. In the course of his studies he formed a nearly complete collection of the species of the world, on which for the most part his numerous papers on the group have been based. In order to devote his attention more particularly to the aquatic families, to the knowledge of which he has made such notable contributions, he at last determined to relinquish the investigation of the small forms comprised in the Geocorinæ, and his collection of these insects is now in the keeping of the Department of Zoology of Smith College.

This remarkable collection, recently received in perfect condition, consists of 670 specimens, representing 130 species and varieties in the 13 genera listed below. Most of the specimens are provided with individual determination labels in Montandon's hand-writing, and there are a great many special annotations, marking intergradational forms between varieties, etc. The type specimens number 40, all carefully indicated, some of them the only known examples of the species.

In parting with this collection, on which he has bestowed such minute and laborious care, Professor Montandon writes; "Je me consolerai en pensant que mes études pourront vons être profitables en même temps qu'utiles à un éstablissement sérieux." In accordance with the sentiment thus expressed, it is our intention to make the collection useful to students interested in the group, and I shall be glad at any time to compare specimens with Montandon's types and authentically determined material as well as to answer questions concerning them.

As I intend to publish later a generic synopsis based on this material, I shall give here merely a list of the genera represented in the collection, following the tribal arrangment proposed by Montandon in 1913.[1]

GEOCORINÆ.

HENESTARINI.

Henestaris Spinola, 1837.
Engistus Fieber, 1864.
Epipolops Herrich-Schaeffer, 1853.
Apennocoris Montandon, 1907.

GERMALINI.

Germalus Stal, 1862
  Ophthalmocoris Montandon, 1907.
Neogermalus Montandon, 1913.
Ninyas Distant, 1882.

GEOCORINI.

Piocoris Stal, 1872.
Geocoris Fallen, 1814.
Hypogeocoris Montandon, 1913.
  Isthmocoris McAtee, 1914.
Stylogeocoris Montandon, 1913.
Mallocoris Stal, 1872.
Stenophthalmicus Costa, 1875.

---

[1] Nouvelles études sur les Geocorinae (Hemipt.), Bull. Sec. Sci. Ac. Roumaine, XI: 48–60, June 14, 1913. This paper seems to have been omitted from consideration in the preparation of Van Duzee's "Catalogue" of 1917.

NEW SPECIES OF SAW-FLIES (HYMENOPTERA).

By Alex. D. MacGillivray, Urbana, Ills.

The adults of the following new species were all bred from larvæ. The species from Maine were bred by the Maine Agricultural Experiment Station of Orono, Maine, and the species from New York were collected at Ithaca by Dr. Hachiro Yuasa.

Blennocampa abjecta n. sp.

Female—Body black with the following parts white: trochanters, ring on proximal and distal ends of profemora and mesofemora, protibiæ, mesotibiæ, and tarsi; clypeus convex, truncate; antennæ with third segment longer than fourth and fourth slightly shorter than fifth; front without V-shaped furrow, depression surrounding median ocellus; ocellar basin wanting, also frontal crest and lateral walls of ocellar basin; median fovea wanting; lateral foveae distinct, broad, shallow; wings infuscated, particularly the proximal two-thirds; veins, costa, and stigma blackish; saw-guides broken. Length 4.5 mm.

Habitat:—Ithaca, New York, No. 71–1.

This species is related to *abnorma* MacG. The form of the clypeus will distinguish it.

Blennocampa absona n. sp.

Female—Body black with the following parts white: trochanters, distal ends of profemora and mesofemora, protibiæ, mesotibiæ, proximal one-fourth of metatibiæ, and tarsi; clypeus convex, apparently truncate; antennæ with third segment longer than fourth, not as long as combined subequal fourth and fifth segments; front without V-shaped furrow, slight depression surrounding median ocellus; median fovea minute inconspicuous puncture; head uniformly convex, frontal crest, ocellar basin and its lateral walls obsolete; lateral fovea shallow, connected with antacoriæ; wings infuscated, particularly the proximal two-thirds; veins, costa, and stigma blackish; saw-guides with dorsal margin straight, ventral margin broadly rounded, distal end bluntly rounded. Length 5 mm.

Habitat:—Orono, Maine. Sub. 186. The larvæ of this species were collected by the author on the leaves of the common Evening-Primrose, *Œnothera,* where they ate small round holes, like shot holes. When the plant was approached, they would drop to the ground.

This species is similar to *abjecta* MacG. in the topography of its head, but the difference in the color of the legs will distinguish them.

Monophadnus planus n. sp.

The insect described as *Monophadnus nubilipennis* Nort. in Bulletin 22, Connecticut Geol. and Nat. Hist. Survey, page 149, is not this species, but an undescribed one. It may in the future be known under the name of *planus.*

Acordulecera meleca n. sp.

Male—Body black with the following parts yellowish white: clypeus, labrum, mandibles, mouth-parts, narrow line on collar, proximal portion of wings, legs except proximal half of coxæ and distal half of metatarsi; clypeus truncate or slightly convex; antennæ with fourth and fifth segments subequal, the third segment nearly as long as the fourth and fifth together; median fovea a very faint oval depression; ocellar basin with a slight longitudinal mesal furrow, reaching nearly to the median ocellus; head with dorsal aspect uniformly smooth and polished; head and thorax sparsely covered with yellow setæ; head with vertical orbits not expanded; median lobe of mesonotum with a prominent longitudinal furrow; mesoscutellum flat, polished; wings hyaline, very faintly infuscated; veins and caudal portion of stigma yellowish; cell R four longer than broad. Length 4 mm.

Habitat:—Ithaca, New York, No. 196–2–1.

This species is very similar to *marina* MacG.

Acordulecera musta n. sp.

Male—Body black with the following parts whitish: labrum, narrow margin to clypeus, mandibles, mouth-parts, and legs except coxæ and metatarsi; clypeus slightly broadly concave or emarginate; antennæ with third segment distinctly longer than fourth and the fourth slightly longer than the fifth; median fovea wanting; ocellar basin with slight longitudinal furrow extending from median ocellus to between antacoriæ; antennal furrows distinct; vertical orbits broadly rounded; head and thorax sparsely covered with very short white setae; head with dorsal aspect almost bare, polished; furrow of median lobe of mesonotum distinct; mesoscutellum not polished; abdomen sparsely setaceous; wings hyaline except slight infuscation near stigma; costa except proximal portion, stigma, and veins except proximal portions, blackish; cell R four slightly longer than broad; the transverse part of the vein M two received slightly proximad of the middle. Length 4 mm.

Habitat:—Ithaca, New York. No. 144–5–1.

This species is related to *meleca* MacG. The difference in the coloration and the shape of the cell R two will separate them.

ADITA CHIONANTHI A. & S. (LEPIDOPTERA) FEEDING ON TRIOSTEUM PERFOLIATUM L.

By Chas. Rummel, Newark, N. J.

The identity of some unknown larvæ observed for several years feeding on horse gentian or fever wort was disclosed in 1919 by the emergence of a fine specimen of this handsome noctuid reared out of five larvæ.

More persistent search in 1920 resulted in finding four small larvæ on May 10, twelve, also very small, on May 22 and five, half grown, on May 28.

The smooth larva in its early stages is green with a pale blue stripe along the center of back; at maturity, when about 1½ inches long, its color changes to dull green and there are three parallel stripes along the back, the center one light brown, the outer ones reddish brown. When quite small the larvæ feed upon the tender tips of young leaves. Approaching maturity they attack older leaves as well and while resting seek concealment by clinging to the stalks of the food plant or other objects near by. Pupation takes place within the soil. The pupa is chestnut brown and about ¾ inch in length. The moth appears during the first half of September.

Observations were made at the Essex County Park on the Orange Mountains, N. J.

A NEW SPECIES OF ERYTHRONEURA (TYPHLOCYBIDÆ, HEM.-HOM.).

By J. R. Malloch, Urbana, Ills.

The type specimen of the species described herein is deposited in the collection of Illinois State Natural History Survey.

Erythroneura sexpunctata, sp. n.

Male—Head yellow, with faint reddish markings, two round dots on vertex, a broad stripe on each side of face on its upper half, and the center of clypeus black. Pronotum dusky on sides, with two faint reddish vittae in center, and two small black dots near anterior margin. Scutellum red at apex; with a large black spot at each anterior lateral angle. Pleura largely black. Tegmina with a broad fuscous stripe extending from base to apex in center, touching costa from base to proximal extremity of costal placque and for a short distance at distal extremity of same, and inner margin at middle of clavus and in base of fourth apical cell; inner margin of clavus narrowly red. Legs yellow. Abdomen fuscous, segments narrowly pale at apices; hypopygium yellow.

Vertex rounded in front, its length at center barely more than half its posterior width from eye to eye. Venation similar to that by *vulnerata* Fitch, the second apical cell noticeably shorter than third, and the veins forming base of fourth angulated, the vein extending to radial margin, however, at right angles to that margin whereas in *vulnerata* it is slightly sloped apicad at its inner extremity. Hypopygial claspers stouter than in *vulnerata,* but structurally similar.

Length, 3.5 mm. to apices of tegmina.

Type, Muncie, Ill., December 13, 1913 (Hart and Malloch).

This species was recognized as new by Mr. Hart and the name used here is the one he had on the label in our collection.

According to McAtee's recent key to the species of this genus this species falls into the section with *vulnerata* Fitch and the characters in the above description will serve to separate it from that species.

ENTOMOLOGISTS—PROFESSIONAL AND AMATEUR.

Without being invidious, we believe the nonprofessional entomologist has the greater opportunity, if he will only avail himself of it. It is the old story of Mary and Martha over again. The professional Marthas are "busied with many things." The work they have engaged to do bears upon them; their time is scarcely their own; their effort is circumscribed by the direct line of their labors. Eventually, routine smothers them, except they be true enthusiasts or hold exceptional positions. This is particularly true of those in administrative and economic work.

We amateurs have chosen the better part. With a living arising from other fields of effort, we are able to approach only those problems that interest us with unjaded minds. And the great advantage is that one in another walk of life must be an enthusiast to pursue successfuly an avocation alien to his daily occupations.

Cast your eyes about you; consider the founders of the science. They have strictly arisen from the ranks of the enthusiastic non-professionals. They number soldiers, priests, ministers, statesmen, kings, the run of mankind. On this very day, in this country, we see the non-professionals among the leaders in certain groups.

So we believe the greater opportunity and the greater responsibility, therefore, rest upon the enthusiastic, keen, free-lance non-professional. Let him live up to these, and emulate Thomas Say and like him originate lasting monuments of solid, worthy work.

J. R. T. B.

PROCEEDINGS OF THE SOCIETY.

Meeting of April 15, 1920.—Prof. C. F. C. Riley, Syracuse University, was elected to membership.

Verbal Communications.—Mr. Notman recorded the capture of the dragonfly *Cordylea shurtleffi* Scudder, at Keene Valley, Adirondacks, N. Y. This is a boreal species, known from New Hampshire, Labrador and Alaska, and apparently rare in New York State.

Mr. Wm. T. Davis exhibited a male dragonfly, *Boyeria grafiana* Williamson, taken at Fort Montgomery, N. Y., September 7, 1914, by Mr. F. M. Schott. It is an addition to the local list, which now numbers 124 species of *Odonata*. He also showed a living pupa of the seventeen-year Cicada, probably thirteen-year race, found about 6 inches below the surface of the ground by Mr. A. E. Brower, of Willard, Missouri.

Long Island Records.—Mr. Burns showed the moth *Brephos infans* Möschler taken at Rosedale, L. I., April 11.

Scientific Programme.—Mr. Geo. P. Engelhardt gave a very interesting and instructive lecture entitled "Through Newfoundland to Labrador," illustrated with numerous lantern slides. It related his experiences on the trip which he made to these regions in July and August, 1912, together with Mr. C. W. Leng. The physical, climatic, and biological features of the various regions traversed were fully discussed. Some of the most interesting Lepidoptera taken on the trip were exhibited. Among the forms from Newfoundland may be mentioned: *Papilio brevicauda* Saunders, *P. glaucus canadensis* Rotschild and Jordan, *Rusticus aster* Edwards, and a peculiar form of *Œneis jutta* Hübner. In Labrador were obtained *Agriades aquilo* Boisduval and *Ænis norma katadhin* Newcomb.

Meeting of May 13, 1920.—*Verbal Communications.*—Mr. Wm. T. Davis exhibited some insects collected at Lakehurst, N. J., May 31 to June 2, 1918. Among them was the moth, *Pygarctia abdominalis* Grote, which came to light on the very warm evening of June 1, 1918. He called attention to the two other New Jersey records of this species in the BULLETIN of this Society for June, 1913, in connection with the description of *Pygarctia grossbecki* Davis. During the same visit to Lakehurst, several hundred examples of the wasp *Polistes pallipes* Lepeletier were found dead beneath the loose bark of a pitch pine where they had congregated on the approach of cold weather in the preceding autumn. The specimens examined proved to be workers or females.

Mr. Martin showed various interesting moths, among them *Mamestra assimilis* Morrison, from Redford, N. Y., raised from a larva on willow.

Long Island Records.—Mr. Olsen showed the Cicadellid *Aulacizes irrorata* (Fabricius), taken at Kings Park, L. I., by Mr. Bell.

Scientific Programme.—Mr. J. R. de la Torre Bueno, "On the Families of Water Bugs." The various classifications proposed for the aquatic Hemiptera were reviewed and also speaker's own arrangement, which was published in the Canadian Entomologist for 1909.

Meeting of June 10, 1920.—*Long Island Records.*—Mr. Engelhardt related his collecting experiences in the Penniquid Barrens, near Coram, L. I., between Port Jefferson and Patchogue. Among the Lepidoptera taken there in June were mentioned: *Tæniocampa culea* Guénée, very abundant on the blossoms of blackberry and less so at sugar; also *Mamestra anguina* Grote and *Ulolonche modesta* Morrison, both taken at sugar.

Mr. Engelhardt also showed a new *Ægeria* bred from *Viburnum dentatum* collected at Woodhaven, L. I.; it is closely allied to *Ægeria pictipes* Grote and Robinson, but readily distinguishable by the bright steel blue color of the abdomen and the white-tipped antennæ of the female. It may prove to be the European *Æ. andrenæformis* Lespeyres, also a borer in *Viburnum*. *Æ. castaneæ,* thus far considered a synonym of *Æ. pictipes,* proves to be a valid species: the first, a feeder underneath bark of chestnut, has the femora of the hind legs black with two white bands; while *pictipes,* which feeds on cherry, peach, etc., has the femora with three white bands.

Scientific Programme.—Mr. Wheat: "Camping Experiences on Long Island." The speaker narrated his experiences while making a boat trip along the southern shore of Long Island, in quest of marine invertebrates.

Meeting of October 14, 1920.—*Scientific Programme.*—"Accounts of Summer Collecting Experiences by the Members."

Mr. Doll showed *Chrysophanus hypophlæus* Boisduval in a melanistic aberration, from Sullivan Co., N. Y.; also living larvæ of *Apatura clyton* Boisduval, which feed on hackberry (*Celtis*) and hibernate in colonies among dry leaves on the ground, where they can be found in winter under the snow; the specimens shown were obtained at Arlington, N. J.

Mr. Bell mentioned among his captures at Kings Park, Long Island, *Libythea bachmanni* Kirtland and *Strymon liparis strigosa* Harris; he also showed *Aglais milberti* Goddart from Jaffray, N. H., and *Achalurus lycidas* Scudder from Flushing, Long Island.

Mr. Bueno mentioned having found *Phytocoris buenoi* Knight on Norway spruce (*Picea abies*) at White Plains, N. Y.; he also spoke of his stay at Cold Spring Harbor, Long Island, where he found *Cymus breviceps* Stål on sedges, this bug being new to New York State, in the same locality. *Œciacus vicarius* Horvath was taken in two adults from a nest of swifts, while a great number of eggs of that species were attached to the branches of the nest.

Mr. Engelhardt spoke of his finding *Æ. rileyana* Hy. Edwards on Staten Island with Mr. Davis; he also showed a specimen of *Æ. ithacæ* Beutenmuller taken by Mr. Burns at Ithaca, N. Y., and another specimen of the same moth from Clairfield, Pa. (Miss Nell McMurry Coll.); this species was known formerly by the two types only; it bores in the rootstalks of *Helianthus helianthoides.*

Mr. Davis showed a specimen of *Calosoma sycophanta* (Linnæus) collected at St. George, Staten Island, N. Y., and stated that this species had not before been reported from that locality; he called attention to the published minutes of this Society for October 14, 1915 (BULLETIN for February, 1916, p. 18), where Mr. Schott had first reported its occurrence near New York City, at Flatbush and at Fire Island Beach.

Meeting of November 11, 1920.—The death was announced of Mr. G. Wasmuth, a former member, after whom *Papilio philenor* aberr. *wasmuthii Weeks* was named, this form having been found by him.

Scientific Programme.—Mr. Wm. T. Davis read two papers entitled "Notes on Beetles of the Genera *Melasoma* and *Gonioctena,*" and "On the Mating Instincts of *Sphecius speciosus,* the Cicada Killer"; both these communications have been published in the Society's BULLETIN (December, 1920).

Mr. Davis also exhibited some of the insects collected by him on two visits to Wading River, Long Island, in August and September, 1919; a larva of a *Cuterebra* fly, found in a rabbit that had been killed by an automobile, was given to him by Mr. E. S. Miller; the fungus-growing ant, *Trachymyrmex septentrionalis* McCook, was found both at Deep Pond and Long Pond, where it had been sought for in vain in previous years; the shining slave maker, *Polyergus rufescens lucidus* Mayr, was also found at Long Pond, with its usual slave, *Formica schaufussi* Mayr. Several dragonflies, *Anax longipes* Hagen, were reported as having been seen at Walding River also three *Æshna* dragonflies, probably *Æshna clepsydra* Say, flying tandem; the hind pair seemed to be in copulation, while the first individual, probably a male, was holding on to the second male, as in the case of the three *Gomphus lividus* Selys flying together at Long Pond in July, 1917, and reported upon in the Journal of the New York Entomological Society for December, 1918; two specimens of *Sympetrum semicinctum* Say and several *S. costiferum* were collected at Long Pond; a female of the latter had so many mites that the abdomen was much twisted and deformed.

Mr. Geo. P. Engelhardt spoke "On some Ægeriidæ from Long Island," of which family he is attempting a revision based chiefly upon biological data; with a better knowledge of food-plants and habits, many of the species now listed in a disconnected arangement will prove to be mere forms or subspecies expressing the influence of environmental changes in the range of parent species; on the other hand, evidence of the same nature will show that others, now considered as not distinct, are entitled to specific rank; series of the following were shown to illustrate the speaker's remarks: *Ægeria bassiformis* Walker, from Pennsylvania, and its subsp. *eupatorii* Hv. Edwards, from Long Island; *Æ. pyralidiformis* Walker, from Long Island, and its subsp. *sanborni* Hy. Edwards, from Illinois; *Æ. pictipes* Grote and Robinson, from Long Island; and *Æ. castaneæ Busck,* from Long Island.

J. Bequaert, *Secretary.*

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

WANTED.—Cynipidæ and their galls from all parts of the world. Exchange or cash. Western and Southern material particularly desired. Wm. Beutenmuller, Box 258, Highwood, Bergen Co., N. J.

WANTED.—Saldidæ, especially from the Western U. S. and Canada. Will name or give good exchange. J. R. de la Torre-Bueno, 11 North Broadway, White Plains, Westchester Co., N. Y.

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WANTED for cash.—Ova of Catocalæ with or without parent moth. Address George J. Keller, 191 Avon Ave., Newark, N. J.

WANTED.—Brachynus wanted from any part of North America. Cash or exchange. J. W. Green, 520 McCartney St., Easton, Pa.

WANTED.—Corixidæ from all parts of the world by H. B. Hungerford, University of Kansas, Lawrence, Kansas, U. S. A. Exchange or cash.

WANTED.—Species of Rhynchophora from Eastern North America not represented in my collection, in exchange for duplicates from Indiana and Florida. Lists of desiderata and duplicates on application. W. S. Blatchley, 1530 Park Avenue, Indianapolis, Indiana.

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OF THE

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NEW SERIES

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MAY 18 1921
National Museum.

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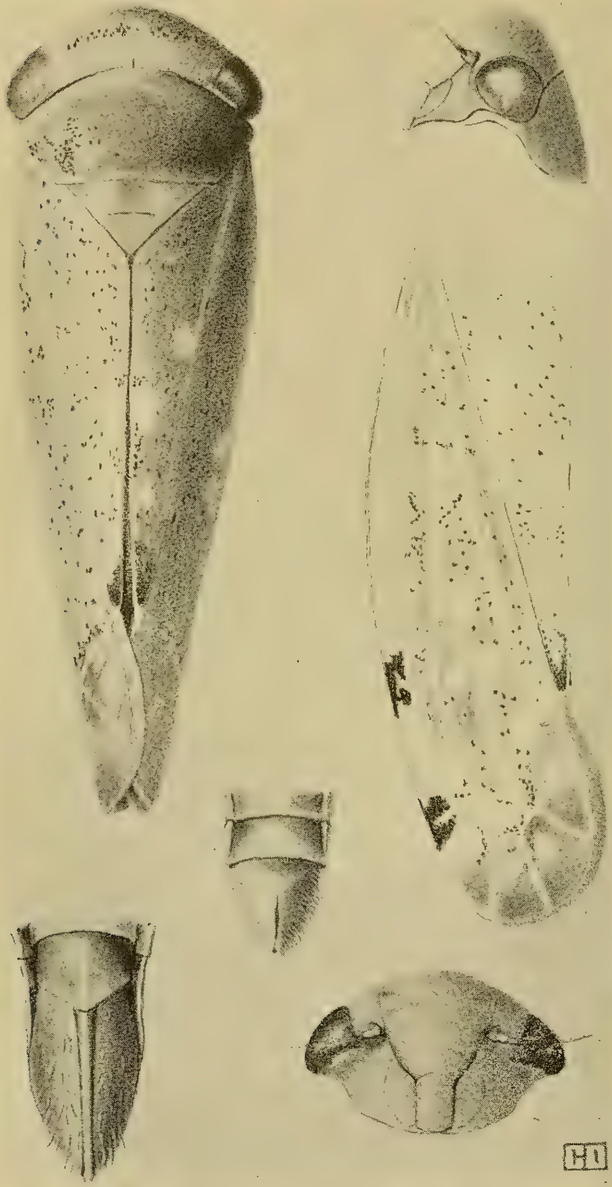

EUSCELIS STACTOGALUS FIEB.

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Vol. XVI April, 1921 No. 2

ANOTHER EUROPEAN LEAFHOPPER IN NORTH AMERICA.

By Chris E. Olsen, West Nyack, N. Y.

In the early part of September, to be precise, on the second day of the month, when Dr. E. D. Ball called at the American Museum of Natural History, he was very much elated over having collected on a few Tamarisk plants in the Museum's backyard, so to speak, a number of *Eutettix osborni,* which species he had described some years ago from specimens taken in Texas. He informed me that thus far it was only known to occur in Texas and California, also on *Tamarix*. Within a few days after that, I had also secured a nice series for my own collection, from the same trees.

In trying to get the *Tamarix* sp. determined, I found that this food-plant was a European introduction (it proved to be *Tamarix gallica*). It then occurred to me that this leafhopper might also be imported from Europe, probably with the food-plant. In this belief I was supported by Dr. Bequaert, who suggested that we might communicate on this matter with some European workers in this group, with whom we were now in touch and receiving exchanges. Accordingly, a few specimens were sent to Mr. E. de Bergevin, of Algiers, with a request to have them compared with European leafhoppers.

About that time I received a box in exchange from Mr. V. Lallemand, of Brussels, Belgium, containing the same little leafhopper but with quite a different name, not only specifically, but also generically, namely *Athysanus stactogalus* Fieb. In due time also I received a reply from Mr. E. de Bergevin, to whom I had sent specimens of our supposed *Eutettix osborni*. He also found that this was the European *Athysanus stactogalus* and while I was gathering these notes I received another fine pair from this entomologist. I thus possess specimens labelled and identified by two eminent specialists of Europe, and my American specimens determined by both of them, and, as I am unable to find any difference from their views, we all agree that our *Eutettix osborni* Ball is a synonym of *Athysanus stactogalus* Fieber.

In going over all the literature available I found that this insect had quite an interesting history taxonomically, which at first seems a little puzzling, owing to the specific name *stactogalus* occurring with two different authors referring to the same insect, Amyot and Fieber sharing the honor of authority. Not being able to find an explanation for this I thought I would follow the thing down through the literature and this is the result:

Amyot in Annales de la Société Entomologique de France (2d Ser., Vol. V, p. 217), 1847, describes very briefly this insect as *Stactogala,* ignoring the Linnæan system of binominal nomenclature, and consequently, in accordance with adopted zoological rules, his singular description becomes a *nomen nudum.* His material came from Paris, Mont de Marsan, giving no number of specimens nor kind of food-plant.

Walker, in "List of Homoptera in British Museum" (Part III, p. 894), 1851, refers to Amyot's *Stactogala* as *Jassus* with an interrogation, apparently considering *Stactogala* synonymous with *Jassus,* without making reference to any species whatever.

Fieber in "Verhandlungen der K. K. Zoologisch-Botanischen Gesellschaft in Wien" (p. 505, Fig. 19), 1866, realized the predicament and erected the genus *Opsius* on Amyot's *Stactogala,* which thus became the type and only species of this genus. Since Amyot's *Stactogala* is *nomen nudum* it cannot bear his authority, even though we are obliged to consult his description, as Fieber only paid attention to it as a genus and referred to *Stactogala* Amyot for the species; it must then be considered as a Fieberian species, but this was not done until a long time after.

Kirschbaum in "Die Cicadinen der Gegend von Wiesbaden und Frankfurt a.M. (p. 90, No. 17), 1868, describes the very same insect as *Jassus* (*Thamnotettix*) *tamaricis,* although he was well aware of Amyot's description, for he remarks in a foot-note that

"It seems very much like Amyot's *Stactogala,* but the latter's description was too short to be able with surety to identify the species in question as such, and the size given, 5–6 mm., speaks positively against it." He must have either overlooked Fieber's paper of a few years previous, or perhaps not recognized his description, but whatever it was, he made no mention of it at all.

Fieber in his "Katalog der europaeischen Cicadinen" (p. 11), 1872, seems to consider his new genus synonymous with *Athysanus* for he places it right in this genus, in fact, it heads the list, which I do not think of any particular significance. Here he also places Kirschbaum's *tamaricis* as a synonym of *stactogalus.* From this time on it has been known in the European literature as *Athysanus stactogalus* Am. He mentions as synonyms of the genus:—*Jassus, Thamnotettix, Opsius,* and *Limotettix.*

Mayr in his "Tabellen zum Bestimmen der Familien und Gattungen der Cicadinen" (p. 33, No. 69), 1884, follows Fieber in placing *Athysanus stactogalus* first on the list, wtih genus *Opsius* a synonym of genus *Athysanus* and *Jassus* in part; he fails to mention or dispose of genus *Limotettix,* and this is rather disappointing as our *stactogalus* is very closely related to that group.

Ferrari in "Bolletino delle Societa Entomologica Italiana" (Vol. 17, p. 289, No. 76), 1885, adds further to its range of distribution by citing a few records of its occurrence in Italy, following Fieber and Mayr in the use of nomenclature.

Melichar in "Cicadinen von Mittel Europa" (p. 261), 1896, redescribes it in the German language as did Kirschbaum, and still maintains Amyot as author.

Ball in Proceedings of the Davenport Academy of Sciences (Vol. XII, p. 39, July, 1907) describes it as *Eutettix osborni* from three examples, one female and two males, from Galveston, Texas, collected in May by Professor Snow. Evidently no notice of food-plant was taken in this case as none is mentioned.

Oshanin in his "Katalog der palaearktischen Homopteren" (p. 108, No. 4160), 1912, lists it as *Athysanus stactogalus* Fieb.; this is the first paper in which I find that Fieber has been credited with authority for the name. He also adds North-Africa and Turkey to its range of distribution and cites *tamaricis* Kirschbaum 1868, as a synonym. This is probably the best determination we have for the species so far, except that *Athysanus* is considered a subgenus of *Euscelis*.

Van Duzee in Transactions of the San Diego Society of Natural History (Vol. II, No. 1, November, 1914) reports *Eutettix osborni* as occurring in great numbers on *Tamarix* at La Jolla and a few from Alpine, on the same plant, both localities San Diego County, California.

Gibson and Cogan in the Ohio Journal of Science (Vol. XVI, No. 2, December, 1915), extend its distribution in this country by reporting it from Missouri; they incidentally hint at a new food-plant, "White Aster, used in ornamental planting." It would be exceedingly interesting to know if the insects lived and thrived on this plant or if they were only casual visitors from a nearby *Tamarix*, as both plants are extensively used in ornamental planting.

Van Duzee in "Check List of the Hemiptera of America, North of Mexico" (New York Ent. Soc., 1916), and same author in "Catalogue of the Hemiptera of America, North of Mexico" (University of California Technical Bulletins, Entomology, Vol. II, November 30, 1917), lists it as Number 2174, *Eutettix osborni* Ball.

Thus we have a chronological review of its taxonomy or as much of the literature as I have been able to consult. As it will be seen by the above, it has been shifted to and fro, and described in various genera, and in one case a genus was erected for it which was subsequently withdrawn, and the species put in an old and well-known genus, but why has it been subject to restlessness in our literature?

This question can only be answered by saying that perhaps our genera in this group are not so well understood as to decide which genus it should be placed in, and where it does not belong; or as Lathrop defines the genus *Euscelis*, "A heterogeneous aggregation, rendering difficult a concise description." It will thus more readily receive species which do not fit in other, nearby genera. This is sure to make a very interesting study, not only for this species, but also for some of the closely allied species. If placed in genus *Athysanus* or, as we now call it, *Euscelis*, there certainly seems to be a vast difference between it and *E. etrusus* and *E. reletivus,* even if considered as separate subgenera. These latter being short and stout insects, with elytra much shorter than abdomen, leathery and without appendix; on the other hand, it compares well with *E. striolus* Fall, which is about the same size and shape, and the elytra much longer than the abdomen, and with an appendix. This latter, together with a few other European species, were at one time placed in a genus erected by Sahlberg, called *Limotettix;* this genus was also recognized by some of our American workers, but is now considered a synonym of *Euscelis* and it is to this group that our leafhopper belongs. In *Eutettix* it does not fit very well as it lacks one of the main characters on which this genus is based, namely, "A more or less transverse depressed line behind the apex of vertex." This is very pronounced in *Eutettix lucida* Van Duzee type of the genus, but entirely absent in *Eutettix osborni* Ball.

It is unfortunate that the descriptions of both, the genera *Euscelis* Brullé and *Athysanus* Burmeister, are not easily accessible; I have not been able to consult either. It seems that this group of leafhoppers could stand a very thorough review, with the probable result that all our old tables and keys, both European and American, would prove to be faulty and not reliable in determining the species.

For the present it is therefore best to leave it as *Euscelis stactogalus* Fieber, in the subgenus *Athysanus.*

In the March number of the "Bulletin of the Entomological Soc. of France" (1920, pp. 82–83), Mr. E. de Bergevin has published a brief note on the subject. I may add that I have seen two specimens of this *Athysanus stactogalus,* taken at College Farm, New Jersey, July, 1915, by Mr. E. L. Dickerson; they had been named *Eutettix osborni* by Mr. E. P. Van Duzee. Mr. Dickerson does not think they came from *Tamarix,* as there are none of these plants on the farm. The specimens differ somewhat in color, being more yellowish-green and lacking the sprinkling of small, black dots, but my collection contains specimens which vary to this extent even when taken from the same plant at the same time. Specimens are at hand from Europe which lack these markings, and compare well with Mr. Dickerson's examples.

A MALFORMATION IN LACHNOSTERNA.

By Wm. P. Hayes, Assistant Entomologist, Kansas State Agricultural Experiment Station.[1]

While rearing white grubs and beetles of the genus *Lachnosterna* from material collected in the fields, an unusual malformation of the prothorax of an adult *Lachnosterna crassissima* Blanch. came under the writer's observation. The specimen was collected in the larval stage behind the plow in sod-land on the campus of the Kansas State Agricultural College on August 12, 1920, along with several hundred other grubs. It was placed

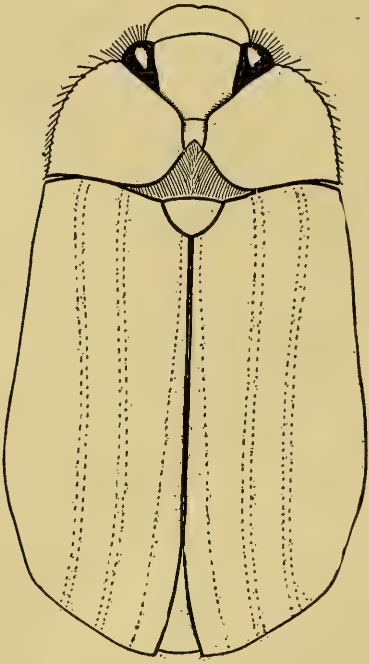

Fig. 1.

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[1] Contribution from the Entomological Laboratory, Kansas State Agricultural College, No. 60. This paper embodies the results of some of the investigations undertaken by the writer in the prosecution of project No. 100 of the Kansas Agricultural Experiment Station.

alone in a one ounce salve box and fed grains of wheat. Nothing unusual concerning the grub was noted at the time and no special care was given it, and as far as the writer knows it received no rougher treatment, which might cause a malformation, than any of the others collected at the same time. Some of these grubs have matured and others are alive at the time of writing.

The time at which the prepupal condition was assumed was not noted. On August 25, 1920, pupation occurred and no unusual condition of the prothorax was observed. Exactly one month later (September 25) the beetle emerged from its pupal "skin," which was shed normally.

The tergum of the prothorax was found to be divided longitudinally, as shown in Fig. 1. Otherwise, the beetle had developed normally and was kept alive until the full adult coloration was assured, when it was placed in a cyanide bottle and killed.

At the nearest points of the mesal margins of the divided tergum, there is an intervening space of approximately one millimeter.

The mesal margins are not jagged but smooth and closely resemble the caudal margins. For a short distance the margins are nearly parallel, but soon diverge both caudad and cephalad to form well-rounded edges. The caudal divergence leaves a considerable portion of the mesothorax exposed, showing the hirsute nature of this region lying immediately under the caudal margin of a normal specimen. An examination of other specimens shows the cephalic margin of the mesothorax to be straight and at right angles to the longitudinal axis of the body. In this form it appears sharply angulate with the apex of the angle pointing cephalad.

Between the parallel mesal margins and cephalad of the mesothorax can be seen a considerable portion of the cervical membrane. The margins of the anterior divergence are less rounded than those of the posterior divergence, and where the margins approach the head rather prominent angles are found. The row of fine golden-colored hairs normally found on the anterior margin are present and extend into the separation almost to the mesothorax.

On each half of the tergum near the cephalomesal angles, there is a short and rather deep punctured depression. These are represented in the illustration by the dotted lines. Slightly caudad of the right depression is the small, smooth, impunctate area, representing the short impunctate median line found in the normal beetle. No trace of it is found on the left side.

The writer can make no explanation of this division of the prothorax, but wishes to call attention to the fact that an examination of a normal specimen of the species reveals on the ental surface of the protergum an arrangement of the points of origin of the large, conical shaped, dorsoventral muscles which, in a measure, correspond, on their mesal points of origin, to the general outline of the mesal margins of the divided protergum. Can muscular stress have played an important rôle in causing this division? A second question naturally follows the first. What is the significance of the median longitudinal impunctate line so common in many insects? May it not represent the fusion of sutures in some ancestral form and may not the case in hand be a reversion to type?

A NEW LIXUS FROM NEW JERSEY.

By H. C. Fall, Tyngsboro, Mass.

Lixus bischoffi n. sp.

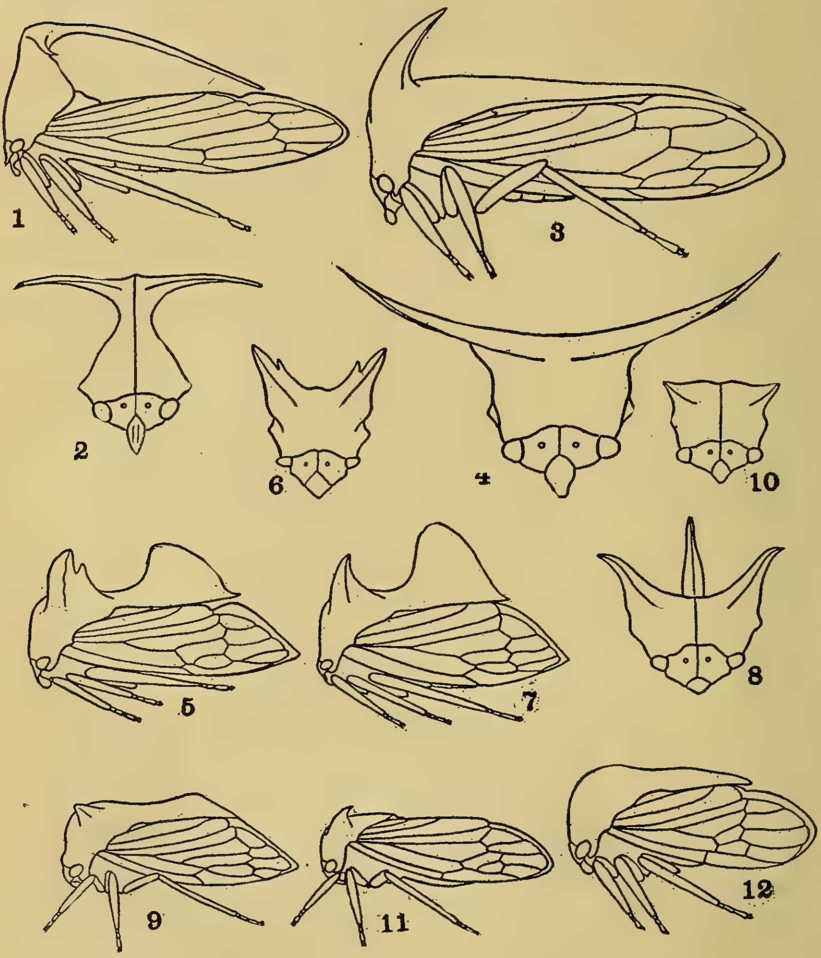
Form elongate, parallel, but rather stout; black, lustre dull, surface thinly clothed, as in *concavus,* with very short appressed ashy white squamiform hairs, which are feebly and finely mottled on the elytra, and become abruptly denser at the sides of the prothorax. Antennæ (♀?) inserted slightly behind the apical two-fifths of the beak, 2d funicular joint slightly longer and just perceptibly narrower than the first, equal in length to the next two; club rather stout, equal in length to the preceding four joints, and scarcely longer than half the funicle. Beak as long as the prothorax, cylindrical, moderately arcuate, finely feebly punctate apically,

> but with numerous intermixed punctures basally; median line obsoletely subcarinate between the interocular and interantennal foveæ. Prothorax slightly wider than long, sides nearly parallel in basal half, thence obliquely narrowed and feebly constricted; dorsum broadly impressed basally, the impression bounded in front by a feeble transverse tumidity a little in advance of the middle; surface finely obscurely punctate with numerous scattered coarser punctures. Elytra conspicuously wider than the prothorax; humeri short, oblique; sides parallel to about apical third thence gradually arcuately narrowed to apex, the sutural notch very small. Body beneath and legs substantially as in *concavus*. Length (exclusive of beak) 13 mm.; width 4.3 mm.

Described from a single example—probably a female—kindly given me by Mr. Edwin A. Bischoff. The type is one of a series of five specimens taken at Murray Hill near Berkeley Heights, New Jersey, by Mr. Bischoff who writes me that they were beaten from a large flowering thistle early in September.

This fine species is rather closely similar in size and general appearance to *concavus,* but differs most notably in the disparity in width of the prothorax and elytra, and in its relatively short and stout antennal club, which in *concavus* is much narrower and very distinctly longer than half the funicle. There are also several minor differences such as the more parallel sides of the prothorax, relatively shorter 2d funicular joint, stronger more oblong elytral punctures, and smaller apical sutural notch.

I am placing with the type a specimen taken by myself at Farmington, New Hampshire, in my early collecting days, and long held as *concavus* in accordance with the identification then made for me. It agrees well in essential features with the type of *bischoffi* and is probably identical. It is a little smaller and with shorter beak and probably a male. Of the four remaining examples taken by Mr. Bischoff three remain in his collection, and one is in the collection of Mr. C. W. Leng.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Oriental Membracidae.
Original drawing by W. D. Funkhouser.

NEW MEMBRACIDÆ FROM CHINA AND JAPAN.*

By W. D. Funkhouser.

Leptobelus decurvatus sp. nov. (Figs. 1 and 2).

Near *Leptobelus gazella* Fairmaire and *Leptobelus dama* Germar but differing from both in color, in the shape of the pronotal column and in the position of the posterior process.

Large, slender, pronotum dark brown, tegmina smoky-hyaline; suprahumeral horns extending almost directly outward; posterior process strongly decurved, extending almost as far as tip of abdomen and almost touching internal margins of tegmina; undersurface of body dark brown; legs ferruginous-brown.

Head wider than long, dark brown, roughly sculptured, coarsely punctate, sparingly pubescent; basal margin sinuate; eyes large, brown, mottled, prominent; ocelli large, prominent, reddish, somewhat protruding, farther from each other than from the eyes and situated slightly above a line drawn through centers of eyes; inferior margins of genæ sinuate, flanged, the edge distinctly turned outward; clypeus long, narrow, more than twice as long as wide, extending for more than twice its length below the inferior margins of the genæ, brown, punctate, pubescent, a longitudinal ridge on each side median line, tip acute and pilose.

Pronotum dark brown, lighter in front, almost black on posterior process, closely and coarsely punctate, sparingly pubescent with grayish hairs; anterior pronotal process erect, turriculate, the apex giving rise to two long, pointed suprahumeral horns and the long, slender, strongly decurved posterior process; metopidium nearly perpendicular, twice as wide at humeral angles as at base of horns, strongly centrally carinate; median carina strongly percurrent; humeral angles prominent, triangular, blunt; suprahumeral horns long, sharp, triangular at base, carinate before, behind and below, black, punctate, extending almost directly outward, tip slightly bent downward and backward, apex acuminate; posterior process long, decurved, slender, the base remote from scutellum and arising from a point on the anterior process as high as the suprahumeral horns, the tip sharp, extending backward almost as far as the end of the abdomen and bent downwards to nearly touch the tegmina; scutellum entirely exposed, longer than broad, base swollen, apical half flat, tip rounded, very slightly notched in middle at extremity.[1]

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* Contribution from the Zoölogy Laboratory of the University of Kentucky.

Tegmina very long, wrinkled, uniformly smoky-hyaline; base narrowly ferruginous-brown and punctate; veins prominent and reddish, sparingly pilose; tip rounded; five apical cells. Hind wings hyaline with four apical cells.

Undersurface of body uniformly dark brown, punctate rather densely pubescent with grayish hairs; abdomen black, the segments narrowly margined with ferruginous; legs entirely ferruginous-brown.

Length to tips of tegmina 9 mm.; width between extremities of humeral angles 2.8 mm.; width between tips of suprahumeral horns 6.6 mm.

Type: Female. Type locality: Kiautschau, China.

Described from three females and three males from Kiautschau, China, one female from Kinkiang, China, and one female from Sikkim, India. Type, allotype and paratypes in author's collection.

Centrotypus laticornis sp. nov. (Figs. 3 and 4).

Near *Centrotypus flexuosus* Fabr., but larger and differing particularly in the much wider spread and different shape of the suprahumeral horns.

Large, blue-black, very coarsely punctate, sparingly pubescent; distance between tips of suprahumeral horns greater than length of body including tegmina; posterior process extending far beyond tip of abdomen but not reaching apices of tegmina; tegmina smoky-hyaline with costal margins black; undersurface of body black; legs black-brown except tarsi which are ferruginous-brown.

Head wider than long, roughly sculptured, black, finely punctate, sparingly pubescent; basal margin convex in center, depressed at sides; eyes very large, prominent, gray; ocelli large, prominent, gray, a very little farther from each other than from the eyes and situated slightly above a line drawn through centers of eyes; inferior margins of genæ smooth, somewhat convex, slightly flanged; clypeus twice as long as wide, black, finely punctate, densely pubescent except for a smooth linear area on each side of median line, extending for more than half its length below the inferior margins of genæ, tip rounded, slightly protruding and pilose.

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[1] Distant has given as a character for his division Micreunaria (Fauna of British India, Vol. IV: p. 14. 1907) the description of the scutellum as being "apically acuminate." This does not hold for a number of species of *Leptobelus* (*e.g.*, the above) nor of *Telingana* (*e.g.*, *T. balteatus* Dist.).

Pronotum blue-black, very closely punctate, sparingly pubescent, the pubescence being more dense just above the head and on posterior bases of suprahumeral horns; metopidium about as wide as high, constricted just above head and then swollen to the bases of suprahumeral horns, convex in front, flattened between horns; median carina percurrent, well defined behind horns but faint over metopidium; humeral angles broad, triangular, blunt, situated well back of eyes; suprahumeral horns very long, more than twice as long as the distance between their bases, blue-black, coarsely punctate, not pubescent, much flattened dorso-ventrally, very wide as seen from above, extending outward, upward and backward in a gradual curve, the tips gradually acute, foliaceous (not obliquely truncate as in *C. flexuosus*), a strong carina on both upper and under surfaces extending the full length of the horn just before posterior margin; posterior process long, heavy, tricarinate, blue-black, coarsely punctate, not pubescent, base slightly elevated above scutellum, tip somewhat decurved, impinging on tegmina and extending far beyond end of abdomen but not reaching tips of tegmina; scutellum plainly visible at sides, black, finely punctate and densely pubescent.

Tegmina long, rather narrow, smoky-hyaline except at base where the costal area is blue-black for more than half the length of the tegmina and of the width of the two basal costal cells; veins prominent, upraised, ferruginous except along costal margin on which the two external veins are black; base narrowly black-brown and punctate; tip rounded and slightly tinged with ferruginous; five apical cells; the two basal costal cells ending at about the same distance from the base.

Undersurface of thorax brown-black, densely and finely pubescent; abdomen black, finely pubescent below; legs black-brown except tarsi which are ferruginous-brown.

Length including tegmina 11 mm.; width between tips of humeral angles 4 mm.; height of metopidium 2.5 mm.; distance between extremities of suprahumeral horns 12 mm.

Type: Female (from the Kirkaldy Collection). Locality: Riviere Claire, Haut-Tonkin, Madon.

Type in author's collection.

Pantaleon brunneus sp. nov. (Figs. 5 and 6).

Near *P. montifer* Walker, the type of the genus, but larger, and differing in color and in the shape of the posterior elevation.

Large, heavy-bodied, uniform brown with foliaceous markings of ferruginous on the posterior elevation; suprahumeral horns bifid, the anterior branch much the larger; posterior elevation longer than high, higher in front than behind, extending slightly beyond internal angles of tegmina; tegmina brown, opaque, slightly lighter in color at apices, tips decidedly pointed; legs and undersurface of body uniform brown.

Head about as long as wide, roughly sculptured, uniformly dark brown, finely punctate, densely pubescent with grayish hairs, base sinuately convex; eyes wider than high, light brown, not prominent; ocelli small, light brown, not conspicuous, about equidistant from each other and from the eyes and situated about on a line drawn through centers of eyes; inferior margins of genæ sinuate, sloping, angular just below eyes; clypeus about as long as wide, brown, punctate, pubescent, the lateral margins continuing in a nearly straight line the line of the inferior margins of the genæ, tip blunt and somewhat pilose.

Pronotum brown, roughly sculptured, finely punctate, rather densely pubescent; metopidium about as broad as high, perpendicular above the head, swollen along median line; median carina strongly percurrent; humeral angles large, prominent, blunt; suprahumeral horns very heavy, thick, irregular, considerably longer than the distance between their bases, extending upward, outward but not forward, the tips slightly bent backward, extremity bifid, the anterior prong much larger, longer and heavier than the posterior, centers of lateral margins roughly ridged; posterior process short, heavy, suddenly acuminate, bearing in the center a high elevated disc, this disc longer than high, laterally compressed, the anterior margin almost perpendicular, the dorsal and posterior margins rounded, the sides marked with irregularly branching ferruginous lines; tip of posterior process sharp and extending just beyond internal angles of tegmina; scutellum narrowly visible on each side.

Tegmina brown, opaque, slightly lighter in color along internal apical margin; veins prominent, somewhat upraised; base brown, coriaceous, punctate and sparingly pubescent; tip decidedly acute.

Legs and undersurface of body uniformly brown; tibiæ and tarsi minutely spined.

Length to tips of tegmina 7 mm.; width between apices of suprahumeral horns 3.5 mm.

Type: Female. Locality: Kiautschau, China.
Type in author's collection.

Pantaleon dorsalis Matsumura.

1912. *Centrotus dorsalis* Mats. Die Cicadinen Japans, p. 18.

It is evident from the original description[2] that this insect should be placed in the genus *Pantaleon* which Distant has erected[3] for the reception of *Centrotus montifer* Walker. Professor Matsumura's description of the "gegabelt" suprahumerals and the "halbkreisformig" posterior process (which perhaps suggested the specific name) shows that the species cannot be a true *Centrotus* and leaves little doubt as to its position in *Pantaleon*.

Antialcidas erectus sp. nov. (Figs. 7 and 8).

Entirely ferruginous except head, lower half of metopidium and undersurface of horns which are ferruginous-brown; suprahumeral horns tricarinate, extending outward and upward, each horn about as long as the distance between their bases; posterior elevation very high, subtriangular, laterally compressed; tegmina ferruginous, semiopaque, pointed at tips; legs and undersurface of body ferruginous.

Head somewhat wider than long, subquadrate, ferruginous-brown, finely punctate, sparingly pubescent; base sinuately convex; eyes wider than high, gray, not prominent; ocelli small, glassy, not prominent, about equidistant from each other and from the eyes and situated well above a line passing through centers of eyes; inferior margins of genæ nearly straight, sloping downwards from eyes, angular below eyes; clypeus longer than wide, extending for about half its length below inferior margins of genæ, lateral margins continuing in an almost straight line the line of the inferior margins of genæ, tip rounded, deflexed, pilose.

Pronotum ferruginous, darker at base of head and below suprahumerals, finely punctate, sparingly pubescent with grayish hairs; metopidium wider than high, perpendicular above the head, upper half ferruginous, lower half dark ferruginous-brown; median carina strongly percurrent; humeral angles triangular, blunt, not prominent; suprahumeral horns strong, heavy, simple, tricarinate, about as long as the distance between their bases, extending outward and upward with the tips suddenly bent outward; posterior process short, bearing above a high triangular crest, this crest much compressed laterally, the front margin almost vertical, hind margin sloping, crest almost twice as high as horns, tip of posterior process acute; scutellum narrowly exposed at sides.

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[2] Matsumura, S., "Die Cicadinen Japans II," Annotationes Zoologicæ Japonenses, Vol. VIII, Part 1, p. 18, No. 5.

[3] Distant, W. L., "Rhynchotal Notes—LIX," *Annals and Magazine of Natural History*, Ser. 8, Vol. XVII, p. 327, April, 1916.

Tegmina ferruginous, slightly lighter at internal apical margin; semiopaque throughout; base coriaceous, punctate, sparingly pubescent; tip decidedly pointed; four apical cells.

Legs and undersurface of body uniformly ferruginous; sides of thorax densely pubescent; tibiæ finely spined and pilose.

Length to tips of tegmina 6.5 mm.; width between extremities of suprahumeral horns 4.7 mm.

Type: Female. Locality: Kiautschau, China.

Type in author's collection.

The difference between the genera *Pantaleon* and *Antialcidas* seems to lie almost entirely in the structure of the suprahumeral horns; those in the insects belonging to the former genus being bifid while in the latter they are simple. The wing venation in the two genera is apparently identical.

Maurya angulatus sp. nov. (Figs. 9 and 10).

Brown mottled with blackish, punctate, pubescent; suprahumeral horns short, blunt, extending outward and forward, no longer than the distance between their bases; posterior process bearing a rather high, compressed dorsal ridge, the posterior margin of this ridge continuing the line made by the interior apical margins of the tegmina; tegmina brownish, subhyaline, tip decidedly pointed.

Head wider than long, roughly sculptured, sordid brown, the fine punctuation almost entirely hidden by the dense pubescence; base sinuately convex; eyes large, prominent, gray; ocelli small, glassy, not prominent, about equidistant from each other and from the eyes and situated above a line drawn through centers of eyes; inferior margins of genæ sinuate, flanged; clypeus longer than wide, extending for about half its length below inferior margins of genæ and nearly continuing the outlines of these margins.

Pronotum brown, somewhat mottled with irregular blackish patches, finely punctate, densely pubescent with grayish or silvery hairs, very roughly sculptured; metopidium decidedly wider than high, much swollen in center, slightly protruding at base of head, sunken below horns; median carina strongly percurrent; humeral angles small, blunt, not prominent; suprahumeral horns short, blunt, auriculate, no longer than the distance between their bases, extending outward and forward but not higher than the crest of dorsum, somewhat compressed dorso-ventrally, tips rounded; scutellum narrowly exposed on each side; posterior process heavy, elevated into an angular compressed crest in center, impinging on tegmina, posterior margin, as seen from the side, continuing the line of the internal apical margins of tegmina, tip acute and reaching just to internal angles of tegmina.

Tegmina translucent brownish mottled with irregular darker flecks; veins prominent, brown, finely pubescent; base coriaceous, punctate, pubescent; tip narrowed, acute, somewhat tinged with ferruginous.

Legs and undersurface of body uniform sordid brown; sides of thorax densely pubescent; tibiæ densely pilose.

Length to tips of tegmina 6.2 mm.; width between tips of suprahumeral horns 3 mm.

Type: Female. Locality: Kiautschau, China.

Described from three females. Type and paratypes in author's collection.

Maurya brevicornis sp. nov.

Near the preceding but with the suprahumeral horns very much shorter, the posterior process more uniformly elevated and the tegmina almost entirely hyaline.

Small, brown, punctate, pubescent; suprahumeral horns very short and blunt, not extending outward as far as the humeral angles; posterior process only slightly higher at posterior angle than at base; tegmina almost entirely hyaline except at base where it is brown and opaque.

Head wider than long, subquadrate, roughly sculptured, very dark brown, finely punctate, densely pubescent; base strongly sinuate, convex; eyes large, brown, prominent; ocelli small, pearly, conspicuous, slightly farther from each other than from the eyes and situated well above a line drawn through centers of eyes; inferior margins of genæ rounded; clypeus more than twice as long as wide, extending for two thirds its length below inferior margins of genæ, tip broadly rounded and densely pilose.

Pronotum castaneous-brown, darker near head, finely punctate, densely pubescent with golden hairs; metopidium wider than high, very roughly sculptured, depressed above eyes and at bases of suprahumeral horns, swollen in center, protruded at base of head, somewhat darker in color on lower third; median carina strongly percurrent; humeral angles large, prominent, blunt, extending outward farther than the suprahumeral horns above them; suprahumeral horns short, heavy, blunt, roughly tricarinate, extending directly outward, not at all forward or upward, not reaching as far laterad as the tips of the humeral angles nor farther dorsad than the crest of the dorsum; scutellum well exposed on each side, much darker in color than the pronotum above, finely punctate, sparingly pubescent; posterior process impinging on tegmina, strongly and uniformly elevated in middle to form a high compressed ridge, the dorsal line of this ridge nearly straight, the posterior margin continuing the line of the internal apical margin of tegmina, posterior angle marked with black, tip gradually acute and just reaching internal angles of tegmina.

Tegmina hyaline, much wrinkled, iridescent; veins prominent, brown, somewhat upraised, sparingly pubescent; base narrowly brown, coriaceous, punctate, pubescent; tips decidedly pointed, slightly tinged with brown; marginal membrane very narrow.

Undersurface of thorax uniformly dark brown; sides of thorax densely pubescent with long matted grayish hairs; undersurface of abdomen black and punctate; legs ferruginous-brown.

Length to tips of tegmina 6 mm.; width between tips of humeral angles (which is the maximum width of the body) 2.9 mm.

Type: Female. Locality: Harima, Japan.

Described from two females collected at Harima in May, 1916. Type and paratype in author's collection.

Sarritor attenuatus sp. nov. (Fig. 11).

Long, narrow; pronotum black; tegmina smoky-hyaline except base which is black and punctate; suprahumeral horns long, sharp, extending outward, upward and backward; posterior process absent; scutellum entirely exposed.

Head wider than long, black, finely punctate, rather densely pubescent with golden hairs; base high and sinuate; eyes large, prominent, yellow mottled with black, visible from above; ocelli small but very conspicuous on account of their bright yellow color, opaque, a little farther from each other than from the eyes and situated about on a line drawn through centers of eyes; inferior margins of genæ sinuate; clypeus longer than wide, projecting for about half its length below inferior margins of genæ.

Pronotum black, finely punctate, sparingly pubescent; metopidium about as wide as high, nearly perpendicular; humeral angles large, prominent, triangular, blunt; median carina distinctly percurrent; suprahumeral horns about as long as the distance between their bases, extending upward, outward, and slightly backward, tips sharp and recurved; sides of pronotum hollowed out behind horns and before humeral angles allowing the eyes to be seen from above; posterior process not present; scutellum entirely exposed, slightly broader than long, lateral margins projected into teeth, the central area strongly hollowed out; a dorsal triangle of the abdomen exposed between bases of tegmina.

Tegmina long, narrow, wrinkled, smoky-hyaline; base black and punctate; tips rounded; veins prominent and brown.

Undersurface of body black and pubescent; femora brown; tibiæ flavous; tarsi luteous.

Length 6 mm.; width between tips of suprahumerals 3 mm.

Type: Female. Locality: Kiautschau, China.

Type in author's collection.

I should hesitate to describe this species from a single specimen, since the absence of a posterior process suggests the possibility of mutilation, were it not for the fact that the insect agrees in all particulars with the characters laid down by Distant for the genus *Sarritor*[4] even to the peculiar hollowing out of the pronotum which allows the eyes to be seen from a dorsal view, and the unique concave center of the scutellum. The specimen shows no sign of mutilation. The wing venation is the same as that figured by Distant for *Sarritor retusus,* the type species of the genus.

Tricentrus kuyanianus Matsumura.

1912. *Centrotus kuyanianus* Mats. Cicad. Jap., p. 10. No. 6.

Material from Hong Kong which agrees in all respects with Matsumura's description of *C. kuyanianus* shows the hind trochanters armed with spines, which character places the species in the genus *Tricentrus.*

Gargara lata sp. nov.

Near *Gargara majuscula* Distant but smaller and differing particularly in the appearance of the tegmina.

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[4] Distant, W. L., "Fauna of British India," Vol. VI, App., p. 182.

Large, broad, robust, black, punctate and pubescent; metopidium strongly convex and elevated; tegmina entirely opaque, very dark brown mottled with black and ferruginous; suprahumeral horns absent; hind trochanters without spines.

Head nearly as long as wide, black, finely punctate, closely pubescent with short golden hairs; base very high and sinuate; eyes large, prominent, ferruginous; ocelli ferruginous, not conspicuous, about equidistant from each other and from the eyes and situated slightly above a line drawn through centers of eyes; margins of genæ sloping, slightly sinuate; clypeus about twice as long as wide, extending for half its length below inferior margins of genæ and almost continuing the line of these margins.

Pronotum very dark brown, nearly black, punctate, pubescent; metopidium much wider than high, elevated, convex; humeral angles prominent, triangular, acute; median carina percurrent; posterior process strong, heavy, slightly sinuate, tricarinate at apex, tip sharp and extending just beyond internal angles of tegmina; scutellum well exposed on each side.

Tegmina opaque, wrinkled, brown with darker patches; base brown, coriaceous, punctate, pubescent; tip rounded, ferruginous; veins strong, faintly pilose.

Legs and undersurface of body brown, punctate and densely pubescent; tibiæ minutely spined.

Length 6.6 mm.; width between tips of humeral angles 3.4 mm.

Type: Female. Locality: Kiautschau, China.

Type in author's collection.

EXPLANATION OF PLATE.

FIG. 1. Lateral outline of *Leptobelus decurvatus* sp. nov.
FIG. 2. Frontal outline of *Leptobelus decurvatus* sp. nov.
FIG. 3. Lateral outline of *Centrotypus laticornis* sp. nov.
FIG. 4. Frontal outline of *Centrotypus laticornis* sp. nov.
FIG. 5. Lateral outline of *Pantaleon brunneus* sp. nov.
FIG. 6. Frontal outline of *Pantaleon brunneus* sp. nov.
FIG. 7. Lateral outline of *Antialcidas erectus* sp. nov.
FIG. 8. Frontal outline of *Antialcidas erectus* sp. nov.
FIG. 9. Lateral outline of *Maurya angulatus* sp. nov.
FIG. 10. Frontal outline of *Maurya angulatus* sp. nov.
FIG. 11. Lateral outline of *Sarritor attenuatus* sp. nov.
FIG. 12. Lateral outline of *Gargara lata* sp. nov.

A NEW GENUS OF ANTHOMYIIDÆ (DIPTERA).

By J. R. Malloch, Urbana, Ill.

Kingia gen. n.

Generic Caracters.—Female. Eyes bare, separated by one third of the head-width; anterior supraorbital bristle directed forward; interfrontalia with a pair of cruciate bristles; arista nearly bare; parafacial wide; frons produced at base of antennæ; mouth-margin produced rather acutely, extending beyond vertical line of base of antennæ. Propleura with setulose hairs in front of spiracle as in *Anthomyia.* Lower calyptra subequal to upper. Fore tarsi with one or more of the terminal segments dilated; hind tibia with at least three anterodorsal and posterodorsal bristles.

Genotype, *Hylemyia quintilis* Malloch.

I have before me a male which is congeneric with the above and which may be conspecific with it, but of this I am not absolutely certain. It has the following characters: Narrowest part of frons wider than distance across posterior ocelli; all orbital bristles incurved; interfrontalia with a pair of fine cruciate bristles. Fore tarsus not dilated, basal segment with a conspicuous blunt bristle at base on posteroventral surface; hind tibia with two series of stiff erect short hairs, one posterior and the other posteroventral; hind tarsus with a conspicuous blunt bristle near base on ventral surface, which is directed straight downward. Otherwise as female.

The presence of hairs on the propleura separates this genus from all Anthomyiinæ except *Anthomyia* Meigen and *Eremomyioides* Malloch. From the former it may be separated by the shape of the head, and dilated fore tarsi in the female, and the peculiar basal bristles on fore and hind tarsi in the male. From *Eremomyiodes* it may be separated by the bare hypopleura and pteropleura.

The type was from Godbout, Quebec, and the male referred to is from Lakehurst, N. J. (C. W. Johnson).

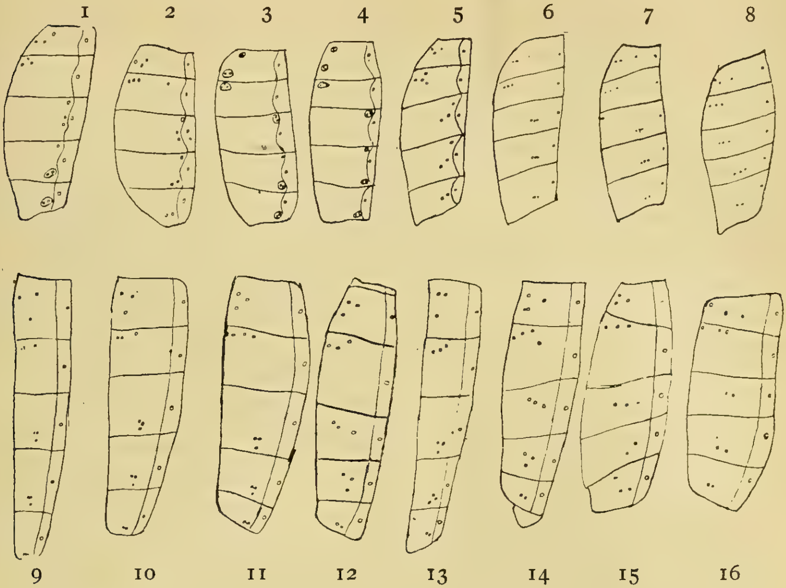
I have named this genus in honor of my old friend and colleague, Prof. J. J. F. X. King, of Glasgow, Scotland.

SYSTEMATIC NOTES ON HEMIPTERA HETEROPTERA.

By J. R. Malloch, Urbana, Ills.

Some months ago I had occasion to examine carefully for comparative purposes certain structures in different orders of insects, and in the course of my work I found some features which have to my mind not received the recognition they are entitled to at the hands of systematic entomologists.

In classifying the Pentatomoidea, and especially the Cydnidæ, I found the arrangement of the spiracle and the two sensory punctures caudad of or adjacent to it of considerable importance, and have embodied my data in a paper already published. In making a more extended survey of the Heteroptera I was struck by the fact that the number and arrangement of the sensory punctures, each of which usually bears a long hair, differs in those families I have examined from that in Pentatomoidea and usually the subfamilies may be distinguished by means of the arrangement of the punctures. In Pentatomoidea there are, so far as I have seen, two punctures behind or adjacent to each spiracle, but in Coreidæ and Pyrrhocoridæ, the two families I have given most attention to, there are 3 punctures on sternites 2 to 5 and 2 on the sixth. In all cases in these two families the punctures on second and third segments are far removed from the spiracle, being much nearer to the ventro-median line than to the lateral margin. On the subfamily Alydinæ the arrangement of the punctures is almost the same in *Protenor, Darmistus, Esperanza* and *Leptocorisa,* and different from that in *Hyalymenus, Megalotomus, Alydus* and *Stachyocnemus.* Taking into consideration all the characters of the groups I consider that *Leptocorisa tipuloides* De Geer should be included in the tribe Micrelytrini along with *Protenor* and its allies, but whether the other species now linked with it in Leptocorisini should also be placed there I do not presume to say. The principal distinction between the tribes in so far as the arrangement of the sensory punctures is concerned lies in the position of those on the fourth sternite. In Micrelytrini the anterior two are close together, placed transversely, and considerably in front of third, though all are well distad of middle of sternite. In Alydini the punctures above re-



Pyrrhocoridæ

Euryophthalminæ

1—Euryophthalmus succinctus
2—Arhaphe carolina

Pyrrhocorinæ

3—Pyrrhocoris apterus
4—Dysdercus suturellus
5—Stenomacra marginella

Coreidæ

Corizinæ

6—Harmostes reflexulus
7—Aufeius impresicollis
8—Corizus bohemanni

Alydinæ

9—Protenor belfragei
10—Darmistus subvittatus Stål
11—Esperanza texana
12—Hyalymenus tarsatus
13—Leptocorisa tipuloides
14—Megalotomus 5-spinosus
15—Alydus eurinus
16—Stachyocnemus apicalis

ferred to are at or before the middle of the sternite and are in a transverse or diagonal line.

In Pyrrhocoridæ the genera *Largus* (=*Euryophthalmus*) and *Arhaphe* agree very closely in the arrangement of the punctures. Both have those on fourth sternite in a straight or almost straight longitudinal series close to spiracle, the anterior one situated close to anterior margin of sternite and the posterior one behind middle of sternite. The genus *Stenomacra* (*marginella* H. S.) which is considered as belonging to the same subfamily differs in having the posterior two punctures placed almost transversely at middle of sternite, an arrangement similar to that on fifth, a feature which appears to suggest that the genus is out of place here. Both genera of Pyrrhocorinæ known to me agree in having all three punctures on fourth sternite closely placed on an opaque spot near the anterior margin and almost in longitudinal line with the spiracle.

It is not to be expected that the character here referred to will enable one to formulate a scheme for the classification of tribes or larger categories, but it will I believe be found of value in most families as an additional character for the differentiation of these interesting insects.

There is in the collection of Illinois Natural History Survey a large series of specimens of *Aufeius impressicollis* Stål, most of the specimens being from Urbana, Champaign, and Decatur, Illinois. These agree in all particulars with Texan specimens taken by Mr. Hart.

In the same collection there are the following two species: *Harmostes prolixus* Stål, two specimens, Brownsville, Texas (Hart). This species is new to the United States. *Esperanza texana* Barber, 3 males, 3 females, Brownsville, Texas (Hart).

Since sending this paper to the editor I have seen a much more comprehensive one on the same subject by Tullgren in Entomologisk Tidskrift, Heft 2, 1918, pages 113–132, a copy of which has just come to hand here. As this author considers the sensory or "auditory" hairs to be of very much more importance than previous authors have it is necessary that his data and conclusions be seriously considered by hemipterists in this country especially in connection with the major groupings in Heteroptera.

A COMPOUND LARVA.

By Howard Notman, Brooklyn, N. Y.

The writer was recently engaged in collecting insects on one of the trails in the Adirondack Mountains. In the course of this pursuit a large chunk of wood was turned over in the hope of catching Carabidæ beneath. None were disclosed but a number of small, slender, whitish translucent larvæ were seen wriggling among the decayed leaves. It was at first thought that they might have strayed from some nearby carrion on which such larvæ are frequently to be found. Search was made in the vicinity for a dead bird or mouse or snake. None such could be seen. In the course of the search, however, a strange creature was revealed. This creature seemed to be a large whitish worm of about the thickness of a lead pencil and some four inches in length which was making slow progress among the leaves. Upon closer inspection it proved to be not a single creature but composed of hundreds of the small larvæ found first under the chunk of wood. It was recalled that similar larvæ had been noticed at times under the bark of damp, much decayed logs; and it was concluded that this style of locomotion probably resulted from an effort to preserve the moisture or slime of the bodies necessary for the maintenance of life. It would be vain to imagine what insect catastrophe had induced these larvæ to migrate in such a swarm, though doubtless due fundamentally to a need for a more humid habitation. Perhaps some nearby log had been moved.

It was at first thought that the larvæ might be lepidopterous, since they had well developed black heads, but the writer finally concluded that they were dipterous which surmise was confirmed, by Dr. J. Bequaert, who pointed out an account of similar aggregations of larvæ of flies of the Mycetophilid genus *Sciara,* in Johannsen's "Fungus Gnats of North America."

ILLUSTRATIONS OF THE MALE HOOKS IN NABIS (NABIDÆ, HEMIPTERA).[1]

By Dorothy J. Hickman, Smith College, Northampton, Mass.

In the genus *Nabis* the males are provided with a pair of copulatory hooks (*hami*), which are visible without dissection and are often useful in the determination of species, as their shape is generally characteristic. This was recognized long ago by Reuter who published in 1873 a paper treating several American species, among others, with figures of moderate accuracy.[2] In some recent work on the genus[3] these genital characters have been employed, but without figures, so that it seems appropriate to offer the accompanying illustrations as a further contribution to the study of this group.

All the American species are figured, with the exception of *crassipes* Reut., *heidemanni* Reut., *spinicrus* Reut., *inscriptus* Kirby, and *kalmii* Reut., of which the last two at least are not definitely understood at present.

There is little real variability in the form of the hooks within the species, even in *ferus*, but the structure is so irregular that the aspect changes somewhat with every shift in lighting and position. Thus no attempt is made to indicate the details of surface sculpture, transparency, etc. In *sordidus*, however, we find a considerable variation in form, of which the extremes are shown in Figs. 3 and 4.

Acknowledgment is made to Mr. H. G. Barber for the loan of several valuable specimens and to Dr. H. M. Parshley for the use of material and for advice during the course of the work.

The drawings were made free-hand with the aid of a binocular microscope (10 × oc., 25 mm. obj.) and the figures are magnified about 50 diameters.

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[1] Contributions from the Department of Zoölogy, Smith College, No. 8.

[2] Reuter, "Nabidæ novæ," Ofv. K. Vet.-Ak. Förh., XXIX; No. 6: 79–96, pl. 8, 1872 (1873).

[3] Parshley, "Hem. Peaks Island," Can. Ent., LII: 80–87, 1920.

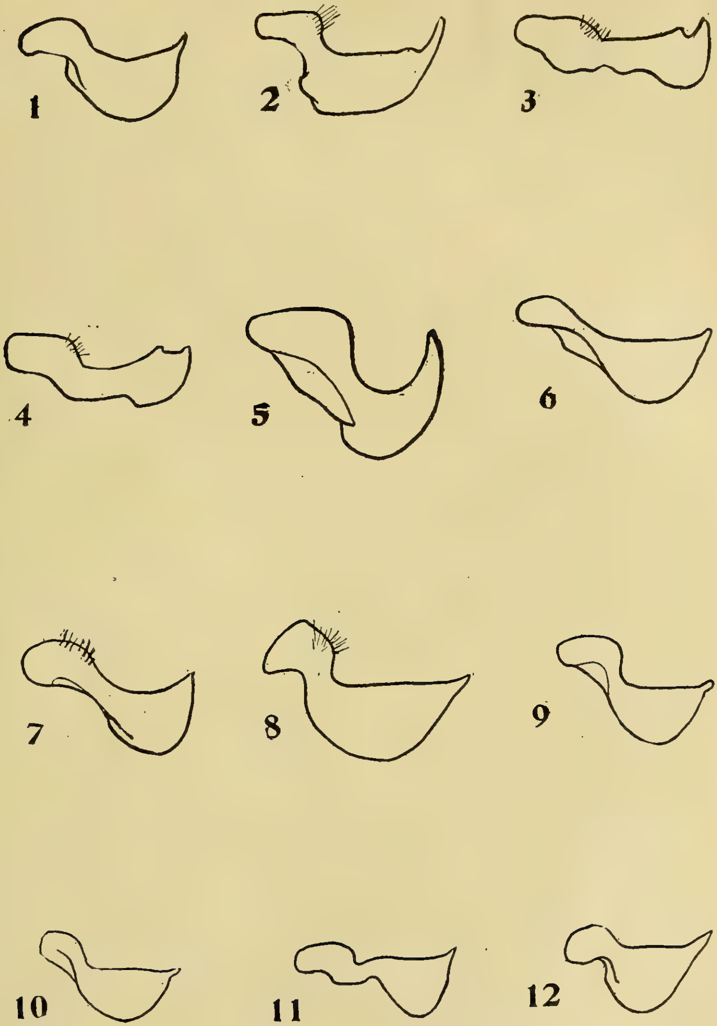

FIG. 1. *N. subcoleoptratus* Kirby.
FIG. 2. *N. nigriventris* Stål.
FIGS. 3–4. *N. sordidus* Reuter.
FIG. 5. *N. annulatus* Reuter.
FIG. 6. *N. propinquus* Reuter.
FIG. 7. *N. limbatus* Dahlbom.
FIG. 8. *N. flavomarginatus* Scholtz.
FIG. 9. *N. capsiformis* Germar.
FIG. 10. *N. ferus* Linné.
FIG. 11. *N. roseipennis* Reuter.
FIG. 12. *N. rufusculus* Reuter.

STANDARDIZED DESCRIPTIONS.

Entomology naturally depends for its progress, particularly on its taxonomic side, on accurateness of observation and keenness of discrimination. The small size of insects in general and particularly of their structures, has compelled the use of magnifiers in order to see. As time has advanced, lenses simple and compound have improved in quality in many ways, and discriminatory characters in insects have in consequence become more and more minute and subtle. The natural result has been that our categories are more sharply and clearly differentiated, with a consequent redefining and splitting up of old genera and even of species. The limit of application of a hand magnifier is reached at × 40. Beyond that, the compound microscope must be used, with its highly enhanced power and the limitations that go with that power and with working in one plane.

The advent of the binocular microscope with erecting prisms has ushered in a new period. New values are perceived and subtle distinctions are appreciable through this instrument of precision. But the extreme accuracy that comes with practicable working magnifications up to × 75, permits a proper examination and appreciation of taxonomic characters. Added to this, the stereoscopic effect of the binocular brings out the true relation of structures to the insect and to each other.

Here, with these high magnifications available, we come to the peril of too fine differentiations, leading to species founded on evanescent or too subtle characters. Far more important, they reveal things beyond the potency of the hand lens, and far more accurately, leading to finding valid though minute and heretofore unsuspected characters. Whence, a description under a magnification of over × 40 under the binocular will contain things invisible under the ordinary hand lens, and make such a description useless to the worker without a binocular; or lead him to a synonym because of the invisibility of these characters, and therefore absence, to him.

It might seem that in all future complete descriptions, two things should be definitely and precisely stated—the first, the *maximum* magnification at which a description is made, or the least magnification at which a given structure is clearly visible; the second, no less important, the *type* of magnifier used, whether a single lens, an ordinary compound microscope, or a binocular. Thus will be taken an important step toward the very necessary standardization of descriptions, with the final goal of accuracy and definiteness, and perhaps consequent stability of species.

J. R. T. B.

NEW RECORDS OF FLORIDA BUGS.

By J. R. de la Torre-Bueno, White Plains, N. Y.

Our old friend Geo. Franck, kindly remembering me, sent me the Hemiptera herein mentioned, all from St. Petersburg, Fla. Strange to say, the majority are Reduviidæ, of rather retiring species.

The Heteroptera are *Euthyrhynchus floridanus* Linn., July 4; *Alcæorhynchus grandis* Dall., June 29; *Piezodorus guildingi* Westw., June 29, Aug. 8; *Nezara viridula* Linn., June 6, Nov. 14; *Euschistus ictericus* Linn., June 29; *Brochymena cariosa* Stål, Aug. 6; *Leptocorisa tipuloides* De G., June 29, July 31, Nov. 1, 18 and 19; *Namacus annulicornis* Stål, June 29, July 6; *Coriomeris humilis* Uhler, Nov. 12; *Lygæus bicrucis* Say, July 4; *Oncopeltus fasciatus* Dall., June 17; *Dysdercus suturellus* Say, May 21, June 29; *Arilus cristatus* Linn., Nov. 1; *Hammatocerus purcis* Drury, May 12; *Sirthenea stria* Fabr., May 21; *Rasahus biguttatus* Stål, May 21, Aug. 8; *Melanolestes picipes* H. S., May 21; *Oncocephalus geniculatus* Stål, Nov. 1; *Stenopoda culiciformis* Fabr., June 2 and 29, Nov. 1 and 14; *Pygolampis pectoralis* Say, June 29, Nov. 1, 12, 18 and 24; *Pnirontis languida* Stål, Nov. 18; *Pn. infirma* Stål, Aug. 6.

These records are all new for the locality and extend the distribution in the state. *Coriomeris humilis* Uhl. has not heretofore been recorded from Florida, although there is no doubt but that it is natural it should be found on the Gulf side since it occurs in Texas.

BOOK NOTE.

An Introduction to Entomology. *Part I—The Structure and Metamorphosis of Insects.*—By John Henry Comstock, Professor of Entomology and General Invertebrate Zoölogy, Emeritus, in Cornell University. (Comstock Publishing Co., Ithaca, N. Y., $2.50 net.)

To attempt an appraisal of Prof. Comstock's finished work seems almost a piece of consummate assurance. To review it adequately would call for a complete discussion of the subject matter.

This volume forms the first part of a more extensive work in preparation, a text-book of entomology. The great progress of the science within the last fifteen years makes such a timely and modern text a great need at present, for all our general books are in many ways outgrown. In the preface, Professor Comstock says: "Two objects are kept constantly in mind in the preparation of the text-book of which this volume is a part: first, to aid the student in laying a firm foundation for his entomological studies; and second, to make available, so far as possible in the limited space of a handbook, a knowledge of the varied phenomena of the insect world."

As the general public becomes more and more aware of the significance of insect life to our own lives and well-being, such knowledge will be more and more sought after and necessary. The growth and increase of purely entomological courses in colleges bears witness to this spread of the desire for knowledge, particularly in a practical form. And this volume we refer to presents these elements authoritatively. It provides a recension of our present-day knowledge of the classification, anatomy, physiology, development and metamorphoses of insects.

To us who study and know insects in some degree, this book by the dean of American entomologists is most welcome and indeed necessary. No further comment is called for to inspire our instant interest.

J. R. T. B.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion. Old notices will be discontinued as space for new ones is needed.

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VOL. XVI JUNE–OCTOBER, 1921 NOS. 3 and 4

A RECLASSIFICATION OF THE SUBFAMILIES AND GENERA OF THE NORTH AMERICAN SYRPHIDAE.

BY RAYMOND C. SHANNON, Bureau of Entomology.

(Published by permission of Chief of Bureau of Entomology.)

The present classification is very largely based upon the original collection of Syrphidae used by Williston when writing his "*Synopsis of North American Syrphidae.*" This collection, now in the U. S. National Museum, and supplemented by the accumulated material, both European and North American, of more recent years has supplied the writer with genotypes of all but twenty-four genera. Where genotype material was not available well-known species of their respective genera were resorted to. Access to several rare species was obtained through the kindness of Dr. J. M. Aldrich and Mr. C. T. Greene. In addition, the collections of Cornell University, the joint collection of Dr. E. G. Anderson and the author, as well as the collection of Mr. W. R. Walton, which he has given to the National Collection.

I wish here to record my name as being among the long list of young men whom Dr. Eugene A. Schwarz has favored with his great kindness and assistance in many ways. Besides helping me greatly in many indirect ways, Dr. Schwarz undertook to read my manuscript, thus aiding greatly in smoothing the language, insuring correct usage of terminology and helping in the construction of scientific names and phrases.

Williston, in his well-known "*Synopsis of North American Syrphidae,*" 1886, page xiii, states: "While, as a general rule, the

Syrphidae present excellent specific characters, there is a remarkable dearth of generic or group characters."

Metcalf in his "*Syrphidae of Ohio*" (Ohio State Univ. Bull. xvii, no. 31), the largest treatise to appear on the North American Syrphidae since Williston's Synopsis, also speaks of the great difficulty in breaking up the family into subfamilies. He states: "It seems to me almost certain that a complete study of larval characteristics and habits, together with what is known of the imagoes, will make possible a satisfactory division of this large family into subfamilies, which is conceded impossible from a consideration of the imagoes alone. The family characters are simple and very definite. The species are also for the most part reasonably distinct. But the presence of many vexing, intermediate forms makes it almost impossible to break the family up into satisfactory subfamilies or in some cases to group the species into genera."

In the present study of the *Syrphidae* an earnest attempt has been made to discover structural characters for dividing the family into subfamilies which would contain natural groups of genera, and, in addition, to give characters for the definition of the genera themselves. Rather a notable success has been made with one group, namely, the *Syrphinae.* This group is characterized by having the humeral calli, and the region between them, destitute of pile; abdomen of both sexes always composed of five visible segments exclusive of genitalia; and, further, it contains all of the aphidophagous species except those of *Pipiza*—a biological character of considerable significance. By using these and supplementary characters, given in the table of subfamilies, the *Syrphinae,* in the old sense, have been split in two; the genera removed therefrom have mostly been considered here as composing the subfamily *Chilosinae.* By this division the classification of the *Syrphinae* and *Chilosinae* has been greatly facilitated; however, there is still much to be desired in classifying the genera of the *Syrphinae,* even as they now stand.

The genus *Chrysotoxum,* which has been variously associated with *Microdon, Sphecomyia* and *Callicera,* and also has been considered as a separate subfamily unto itself, is undeniably a member of the *Syrphinae.*

Characters of the family Syrphidae.

Antennae three-jointed; usually with a dorsal arista, rarely with a terminal style; third vein of the wings without an anterior branch; anal cell acute and prolonged nearly to the wing margin; either a spurious vein present between the third and fourth veins, or a subsquamal plumose filament (the plumula) present, usually both present; empodium bristle-like; hypopygium asymmetrical, an elongated mesocoxal projection present on middle coxae.

TABLE OF SUBFAMILIES OF SYRPHIDAE.

1. Chitinous parts of body thickly punctate; prostigma placed on cephalic aspect of thorax, thorax being foreshortened; abdomen of both sexes consisting of four visible segments; arista as short as the width of third antennal joint; spurious vein of anal cell (elsewhere called the anal furrow, see figure of *Chilosia* wing) very short, not extending as far as anal lobe incision; eyes faintly pubescent. Medium-sized flies.......................... **Nausigasterinae.**

– Body not punctate and otherwise not as above.............2.

2. Antennae very elongate and with a terminal style; anterior crossvein joining discal cell at or beyond the middle; usually an adventitious branch extending into discal cell from third vein; face produced downwards, bare; plumula absent; males holoptic, and with only four visible abdominal segments; females with five abdominal segments. **Cerioidinae.**

– Antennae without a terminal style, excepting in *Callicera* and *Pelecocera,* but these genera have the anterior crossvein joining the discal cell well before the middle...........3.

3. Antennae very elongate, with a bare dorsal arista; face evenly and gently arched, never produced forward at oral margin and entirely clothed with pile; a stigmatical crossvein present; third vein usually (absent only in *Mixogaster:* rather slender flies with yellow abdominal bands) with an adventitious and free branch projecting into the discal cell; apical crossvein upright or recurrent; both sexes with three to four visible abdominal segments exclusive of genitalia; males dichoptic........................ **Microdontinae.**

– Antennae not elongate and possessing dorsal arista, excepting in a few genera, which are without a stigmatical crossvein, and the apical crossvein is parallel with the wing margin

(*Chrysotoxum* and *Sphecomyia*); or, if the apical crossvein is upright or recurrent (*Chrysogaster:* small, broad, black species), then the mouth is produced forward.....4.

4. The humeral calli and region between them distinctly destitute of pile, the head being "cupped" over the anterior end of thorax, causing the pile to end abruptly behind the posterior margin of humeral region (the head may have to be removed to permit examination); antennae placed well above middle of head; arista usually a little shorter than length of antennae; abdomen of *both* sexes with five visible segments exclusive of genitalia; anterior crossvein placed well before middle of discal cell.............**Syrphinae.**

– Pile extending upon the humeral region; abdomen of males with only four visible segments exclusive of hypopygium, females with five.................................5.

5. Apical crossvein recurrent at distal end; marginal cell closed; arista with either long or very dense plumosity; face protruding downwards; wings broad; alula very broad; squamae usually very broad; thorax frequently bearing bristles ....**Volucellinae.**

– Apical crossvein parallel with wing margin, or, if recurrent (*Chrysogaster, Eumerus* and *Merodon*), the arista is bare ....6.

6. Arista long plumose for at least the greater two-thirds of its length; marginal cell open; anterior crossvein placed near or beyond middle of discal cell; either yellow markings present on abdomen, or with dense pile more or less yellow, except *Pyritis,* which has long dense brownish pile; face protruding downwards, or swollen, or tuberculate; *the right prong (or style, Metcalf) of the forceps of the genitalia is longer than the left one and tapers to a sharp point, the left prong developed as an obtuse lobe*..**Sericomyinae.**

– Arista rarely long plumose for one-half its length or more, in such cases some (certain species of *Eristalis*) may be excluded by the closed marginal cell; others (certain *Chilosia*) can be excluded by the absence of yellow body markings or yellow pile, and by having the anterior crossvein placed well before middle of discal cell; finally, the prongs of the genitalia are similar...........................7.

7. Very large yellow and black species; the post stigma very elongate, being very nearly twice as long as broad; marginal cell closed; third vein with a downward loop into discal cell; sixth vein recurrent beyond anal cell; shape of

head, position of antennae and length of arista similar to the *Xylota* type (figure 4), but the face is broadly covered with loose pile (*Milesia* only) . . . . **Milesinae.**

– Length of post stigma one and one-half times or less that of width, and otherwise without above combination of characters . . . . 8.

8. Third longitudinal vein with a deep downward loop into discal cell; face, except for a medium stripe, clothed with long pile; sixth vein entering margin of wing a short distance beyond anal cell, *i.e.*, usual distance; thorax never bearing bristles; marginal cell closed in *Eristalis* and *Meromacrus*. **Eristalinae.**

– Third longitudinal vein usually straight, but in such cases where it is looped downwards (*Pterallastes* and *Teuchocnemis*) the face is bare, except for a few hairs along eye margins, and sixth vein is prolonged well forward beyond anal cell. (The bare face also excludes *Tropidia* and *Syritta* from *Eristalinae*, while the bristles on the thorax and the brassy color excludes *Chrysochlamys*) . . . . 9.

9. Anterior crossvein placed before middle of discal cell; third vein always straight; antennae sometimes with terminal style (*Callicera* and *Pelecocera*) . . . . **Chilosinae.**

– Anterior crossvein joining discal cell at or beyond middle; face rarely covered with pile and in such cases third vein is always straight. . . . . **Xylotinae.**

Remarks on the family, subfamilies and genera.

The present paper is the outcome of a search that was made for characters which would more clearly show from which family, or group of families, the *Syrphidae* were derived, and to what group it gave rise, if any. The quest in this direction has, so far, given meager results. Apparently the existing families of Diptera are, for the most part, so isolated from each other that it is impossible to closely trace true lines of descent.

The long anal cell, extending nearly to the wing margin, undoubtedly connects the *Syrphidae* to those families of the Brachycera that have a long anal cell. Likewise the broad, flat abdomen, common to most *Syrphidae*, with the sides of the tergites not folding downwards and under, indicate close affinities to the Brachycera. But between its closest allies of the Brachycera, probably the *Bombyliidae,* there is a tremendous gap, and apparently no connectant links are existent today. The short anal cell and enfolding (arched) tergites of the *Empididae* and *Dolichopodidae* preclude allying these families with the *Syrphidae.*

There is good evidence that the *Platypezidae* and *Pipunculidae* are closely related to the *Syrphidae,* but they are probably independent groups derived from the ancestral stock of the *Syrphidae* and not, as is frequently considered, offshoots of the *Syrphidae* through *Baccha* and *Paragus;* nor are they the ancestral stock as has been supposed by some authors.

Pipunculus, through its wing venation, parasitic habits, and the possession of a chitinous ovipositor, leads naturally to *Dalmania* of the *Conopidae;* and probably the other extreme of the *Conopidae—i.e., Conops* et al.—lead on to *Pyrgota* (*Ortalidae*).

The similarity in appearance between *Nephrocerus* and *Baccha* is, at the best, only superficial, since *Nephrocerus* does not possess any of several characters peculiar to *Baccha* and the Syrphinae in general. The pile present on the humeral calli in *Nephrocerus* is as long as elsewhere on the mesonotum; there is no plumula; no tongue-like projection of thin chitin on the middle coxa (see below), and no short vertical fold in the wing just beyond the post anal section of the sixth vein; the tergites are arched, *i.e.,* folding under.

The asserted relationship between *Syrphidae* and *Conopidae,* through *Cerioides* and *Conops,* is utterly erroneous. There is nothing in common between the two genera except their great superficial resemblance!

Without doubt the *Syrphidae* represent a free branch of the Diptera, specializing in their own Syrphidid way, which is at an angle from the central line of descent of the order, and not leading through any subbranch or its main branch to any of the other cyclorrhaphous families.

A number of the accepted genera of the *Syrphidae* are, in reality, composed of merely aberrant species or represent at best subgenera. Some of them are heterogeneous groups based upon superficial resemblances. There have been a number of instances where new genera could have been described on characters as strong, and even stronger, than some of those heretofore used. For the present it has been deemed best to keep the same genera so far described and accepted and to add just as few to our list as possible. In only one case has a new genus been erected, namely, *Eumyiolepta,* type *Myiolepta strigilata.* In this case the color of the face made it impossible to conveniently include it under *Myiolepta* in the table, and the structure of the pile of the body is so distinct it is easy to recognize the form as a separate genus. The European genus *Doros* has been included to contain our species *Xanthogramma aequalis.* *Cynorrhina,* formerly considered a subgenus, is here considered of generic rank.

Several tropical genera included in Williston's *Manual,* but of which there is no material at hand, have not been included, as it is impossible to place them in their respective subfamilies. These are listed at the end of the table of genera. *Senogaster* (=*Acrochordonodes*) is of tropical distribution and of very doubtful occurrence in our fauna, hence is not included.

Several more or less radical changes have been made in the status of the subfamilies, but it is believed that they are more clearly defined than before, and an attempt has been made to take care of all aberrant forms. With the subfamilies "circumscribed" on their present basis, it is hoped that other workers will be able to choose a group to greater advantage and will work up the genera in more detail, placing them, thereby, on a more nearly equal rank, and at the same time improve the classification of the species. It is also hoped that structural characters will be used in place of color, for such do exist. Structural characters are more obscure than color differences, but we of the present day, through the aid of the binocular microscope, enjoy a great advantage over Williston and his contemporaries. With our modern means we are enabled to discover many characters that could not have been seen with the olden hand lens that Williston and his colleagues were forced to use.

SYRPHINAE.

The characters of the bare humeral calli; abdomen of both sexes consisting of five visible segments exclusive of genitalia (*Eupeodes volucris* O. S. illustrates this character best); the location of the spiracle of the third abdominal sternite (being located in the middle of the membranous parts on the sides of the sternites, whereas in the other groups it is placed in or near the anterior corners), all serve to very definitely separate this subfamily from the others. In addition, it contains all of the aphidophagous forms, except those of *Pipiza*, a biological character of considerable importance. The hitherto aberrant-considered genus, *Chrysotoxum*, undoubtedly belongs here.

The above characters seem to indicate that the *Syrphidae* have split into two main groups: the Syrphinae, and all of the other groups considered collectively; and that the Syrphinae are specializing in structure from the cephalic aspect and the remainder of the family from the caudal aspect. Nausigasterinae are an exception to both of these groups, as they appear to be specializing from both aspects.

The genera of the Syrphinae have not yet been defined satisfactorily. Many of them have been based on weak characters and frequently there are neither distinct nor, sometimes, natural divisions. The Melanostomini are not sharply defined from the Syrphini; several species in *Syrphus* are doubtfully retained there. The generic limits in the Melanostomini are very weak, being based mostly on male characters. *Rhysops* and *Xanthandrus* are not separated in the table from *Melanostoma*.

A number of the present genera of Syrphini are in reality merely aberrant species of the genus *Syrphus;* and in the case of *Didea, D. laxa* should, according to the present concepts, be placed in a genus of its own, or more preferably be considered congeneric with *Syrphus;* it shows more relationship with species of *Syrphus* than with *D. fuscipes.*

Likewise the genus *Xanthogramma* is a heterogenous one; *X. flavipes* is a typical *Xanthogramma.* The remaining species have very little of the habitus of *flavipes* and evidently are more or less unrelated species of *Syrphus* with yellow lateral mesonotum margins. The European genus *Doros* is here included for *Xanthogramma aequalis* Lw.

Ocyptamus (*Baccha*) *jactator* Lw. clearly connects the *Bacchini* with *Syrphus.*

(*Continued in December number*)

A NEW SPECIES OF BOLTERIA (HETEROPTERA, MIRIDAE).

By Harry H. Knight, University of Minnesota, St. Paul.

(Published with the approval of the Director as Paper No. 257 of the Journal Series of the Minnesota Agricultural Experiment Station.)

In a previous paper (Bul. Brook. Ent. Soc., xiv, pp. 126–128 (1919)) the writer has shown that the unrecognized *Bolteria amicta* Uhler is in fact the same insect which was later described as *Dichrooscytus speciosus rubropallidus* Knight (Bul. Brook. Ent. Soc., xiii, p. 115 (1918)), and that *Dichrooscytus speciosus* Van Duzee stands as a good species in the genus *Bolteria.* A correction should be made in the writer's previous paper (Bul. Brook. Ent. Soc., xiv, pp. 126–128 (1919)) on the genus, in that "*nigropallidus*" should in all cases read *rubropallidus.*

Key to the Species of Bolteria.

1. Frons white, transversely marked with red lines. *amicta* Uhler.
   Frons red or yellowish, transverse lines wanting.......2.
2. Head, pronotum and hemelytra largely bright red. *speciosa* Van D.
   Head and pronotum pale yellowish brown; hemelytra testaceous, clavus and apical area of the corium darkened with fuscous........................*luteifrons* n. sp.

Bolteria luteifrons n. sp.

Structurally differing very little from *amicta,* but smaller and differently colored; testaceous and darkened with brownish and fuscous, front of head not marked with dark lines.

♂. Length 4.2 mm. *Head:* width 1.2 mm., vertex .58 mm., height (from tip of tylus to vertex) .88 mm.; pale yellowish brown, devoid of dark marks, the apical half of tylus more brownish. *Rostrum* attaining the middle of venter, yellowish brown, last two segments infuscated. *Antennae:* segment I, length .43 mm.; II, 1.74 mm., slender, not attaining the thickness of segment I; III, .77 mm.; IV, shriveled; testaceous, the last segment infuscated. *Pronotum:* length .74 mm., width at base 1.37 mm.; minutely punctate, shining, pale yellowish brown, the calli and collar darker brown;

scutellum pale, becoming brownish at base. Sternum and pleura brownish, shining, epimera paler. *Hemelytra:* width 1.68 mm., embolar margins nearly parallel; testaceous, semitranslucent, clavus and apical area of corium darkened with fuscous; minutely pale pubescent. Cuneus pale to yellowish, the apical one-third infuscated. Membrane uniformly fuscobrownish, veins scarcely darker. *Venter:* testaceous to fuscobrownish, shining, pale yellowish pubescent, more prominent on the genital segment; genital claspers infuscated, structurally differing very little, if at all, from *amicta* or *speciosa*. *Holotype:* ♂ April 17, 1908, Raleigh, North Carolina (E. P. Van Duzee); collection of E. P. Van Duzee.

Mr. Van Duzee took the unique type specimen while beating pines in the vicinity of Raleigh. Mr. R. W. Leiby and C. S. Brimley beat pines on two or three occasions the latter part of April, 1920, but were unable to collect additional specimens of this species.

Both *amicta* and *speciosa* occur on pines in their respective western habitats and it seems highly probable that *luteifrons* will, when taken again, be found to breed on one of the pines in the Appalachian region. The species *luteifrons* affords another interesting example of distribution, belonging in a genus which may well be considered western, yet has an eastern representative in the southern Appalachian mountains. According to Dr. E. C. Van Dyke, a close relationship exists between certain species of Coleoptera found in the southern Appalachian mountains and forms which inhabit the mountainous regions of the western United States. The writer finds the same relationship existing between a few species of the family Miridae.

The three known species of *Bolteria* differ very little structurally, but each has a well-marked color aspect. The male genital claspers are so similar in all three species that these structures may well be considered generic in character as is the case in the genus *Paracalocoris*.

CONCERNING SPECIES, WITH NOTES ON PHYTODECTA AFFINIS GYLL. AND PALLIDUS LINN.

By Howard Notman, Brooklyn, N. Y.

Any rule whose operation will surely decide whether two forms are to be considered distinct species or not is obviously of the greatest interest and importance to the student of insects. Most pleasing and, superficially at least, exact in this respect is the rule which draws the line between forms and species by the breeding test—that is, that the offspring of any given female must be considered homogeneous. It is curious that this idea should maintain itself in spite of its evident conflict with the prevailing doctrines of evolution. Moreover, although apparently exact and final in its operation, closer study shows its effect to be inimical to a careful observation of facts in that it tends to destroy confidence in their systematic significance.

Study of inherited variation seems to have shown conclusively that certain characters called dominant appear in a larger proportion of the second generation, where two more or less distinct varieties are crossed. Is it, therefore, altogether impossible that the sexual identity of a species is a dominant character, in which case the corresponding recessive character would be fertile sexual union with closely allied species? The females produced from such a union might well produce offspring referable to either species.

The logic of this suggestion would seem beyond criticism. The following facts observed in the field are presented as of interest in connection with it.

While collecting insects in a meadow at Keene Valley, N. Y., which was partly overgrown with small poplars and willows, the writer's attention was attracted by small reddish, black-spotted chrysomelid beetles which were to be found in numbers on the trees mentioned. Interest was first aroused by the great variability in the marking both on the elytra and the thorax. Further study showed that, although the beetles found on the two trees were almost identical in form, the thoracic marks of those on the willow were never more than two small black spots, sometimes lacking, and that the thoracic marks of those on the poplars were never less than two rather large triangular basal spots with a small central spot between, these sometimes coalesced and extended to the apical margin forming a solid black discal area, in which case an additional small black spot appears in the pale apico-marginal portion. This led to the conclusion that there might be two species. The poplars and willows in the meadow were closely mixed, and the writer studied the beetles with great care during two summers, but failed to note a single instance of either form occurring on the food plant of the other.

The writer has identified the beetles as *Phytodecta affinis* Gyll.—the willow beetle of which *arcticus* Mann. is said to be a variety—and *Phytodecta* (*Spartophila*) *pallidus* Linn.—the poplar beetle. In the Junk *Catalogus* they are placed in different subgenera, distinguished by a slight difference in the prominence of the tooth at the apex of the front tibiae and the number of the thoracic setae.

Thorax with setae at the posterior angles only. All the tibiae strongly toothed at apex..............*Phytodecta.*
Thorax with setae at anterior and posterior angles. Anterior tibiae scarcely toothed at apex..........*Spartophila.*
(Kuhnt, Illus. Bes. Tab. Käf. Deuts., p. 848.)

Drawings of the oedagus of these and the other species of the genus are given in a plate published in the Deutsche Entomologische Zeitschrift. (XXX, 1886, p. 26, taf. I. ff. 42, 47.) The writer has dissected the oedagus from males of the two species and finds them in accord with the drawings. There is considerable difference in the form. In *affinis* the oedagus is slender and rather acuminate; in *pallidus* it is larger at the apex and broadly rounded.

The eggs of the beetles are laid in clusters on the leaves of the food plant and the larvae in their early stages feed in groups. Several of these groups were raised to maturity. Those of the poplar beetle—*pallidus*—exhibited nothing worthy of special note. A group of eight raised on willow were remarkable in that the thoracic marking of four of the specimens was that of the poplar beetle, *pallidus,* the others being typical *affinis.* The eight individuals are somewhat undersized and have soft elytra, due perhaps to lack of skill in rearing. The writer feels certain that these are the offspring of a single female.

That the reproductive function in these beetles is not altogether normal is indicated by the following field note, which is repeated verbatim: "Several days ago I placed in a glass some beetles (*affinis*) taken on willows. After an examination this morning (May 25) I found a number of the small larvae just hatched and in addition three unhatched eggs. They are about one millimeter in length, translucent and of a coral red color. Two of these eggs have hatched during the morning and the third is almost ready to. The formation of the young larva is very rapid. The color is somewhat dull just before hatching. The young larva is of a translucent red; the head and legs being colorless and transparent. The eggs are cylindrical in shape, rounded at the ends and about twice as long as broad. They are gelatinous and without a hard shell; the skin yielding to the outline of the larva as it forms within. Several eggs were laid upon the cork of a vial which hatched out within an hour. They were attached by one end so as to stand in a vertical position. The head of the larva developed at the upper end. The larvae turn black shortly and the thoracic segment may then be distinguished from the others even before the first moult. I have just seen a female lay two of these eggs, in both instances the embryo larva was visible as soon as the egg was completely expelled from the body of the parent. The embryo in one case freed the head and thoracic segments of its body from the sac in which it was born within five minutes and was entirely out within ten minutes from the moment of expulsion." It is evident that on occasion it would be proper to call this species viviparous.

The following record was made of a group of 29 larvae found on poplar: The group was first observed on May 13, probably shortly after hatching. The first moult took place on May 18, the larvae then being 1.75 mm. long; the second moult on May 22, the larvae then being 4.25 mm. long; the third on May 25, the larvae then being 7 mm. long. On May 29 the larvae stopped feeding. They began transforming to chrysalids on June 8 and on June 15 there were 16 chrysalids. Ten had died without transforming. Two were drowned and one was crushed. On June 20 the first adult beetle appeared. (*Phytodecta pallidus* Linn.)

NEW THYSANOPTERA FROM NEW YORK.

By J. R. Watson, Gainesville, Fla.

A small collection of thrips captured in the Adirondacks and about Syracuse during the summer of 1919 by Prof. Carl J. Drake, of the New York State College of Forestry, was submitted to the author for identification, as was also a large series of a single species collected about Syracuse in 1920 by Miss Evelyn Osborn, Professor of Entomology in the School of Agriculture of Syracuse University. Among these are four undescribed species.

Trichothrips drakei n. sp.

Female: Apterous. General color dark brown. Intermediate antennal segments, tarsi, and tibiae lighter brown. *Measurements:* Total body length 2.8 mm. (2.4 to 2.9 mm.); head—length 0.35 mm., width 0.25 mm.; prothorax—length 0.25 mm., width including coxae 0.51 mm.; metathorax—width 0.57 mm.; abdomen—greatest width 0.73 mm.; tube—length 0.31 mm., width at base 0.11 mm., at apex 0.052 mm. Antennae—total length 0.74 mm.;

Segment	1	2	3	4	5	6	7	8	
Length	73	73	120	109	98	87	70	52	
Width	57	39	43	40	36	35	30	20	microns.

Head about 1.75 times as long as wide, widest behind the eyes and converging posteriorly; cheeks slightly arched, bearing a few thick, heavy bristles arising from low, wart-like protuberances; postocular bristles long, reaching beyond the anterior margins of the eyes. *Eyes* small, sunken, occupying less than a fourth of the length and .6 the width of the head; facets small. *Ocelli* large, reddish brown; anterior situated far forward between the bases of the antennae, facing forward; posterior pair situated opposite the anterior half of the eyes and near, but not touching, their margins. Mouth cone long, reaching fully three-fourths of the way across the prosternum. *Antennae* twice as long as the head; segment 1 unusually large, concolorous with the head; segment 2 urn-shaped, nearly as dark as 1; 3 clavate, yellow in the basal 3/5, clouded with light brown apically; 4–6 similar in shape, but the apical brown area becoming progressively larger and darker; 7 and 8 all brown. Sense cones and bristles long, but colorless.

Prothorax (including coxae) about twice as wide as long. Sides nearly straight, but diverging posteriorly. Posterior angles rounded, bearing a single long, pale yellow bristle; 4 or 5 short, heavy bristles on the coxae. Two similar long, yellow bristles along the lateral margin; one a little behind the middle and the other near the anterior angle. A third long yellow bristle near the posterior margin. *Pterothorax* and *abdomen* a lighter brown than the head and especially the prothorax. Sides nearly parallel and slightly arched. *Legs* rather short; fore femora considerably enlarged; as dark as the prothorax; margined with short but rather thick bristles.

Abdomen large and heavy, cylindrical. Each segment bearing a few short bristles on the posterior angles, and on the posterior segments one or two medium long yellow ones. Tube rather small and slender as compared to the abdomen; sides straight, but converging posteriorly; terminal bristles shorter than the tube.

WINGED FORM. Similar to the apterous, but smaller. Total body length 2.2 mm. (2.0 to 2.4). Head—length 0.32 mm., width 0.24 mm.; prothorax—length 0.24 mm., width 0.49 mm.; mesothorax—width 0.52 mm.; abdomen 0.60 mm.; tube—length 0.27 mm., width at base 0.105 mm., at apex 0.05 mm. Antennae—total length 0.68 mm.;

Segment	1	2	3	4	5	6	7	8	
Length	57	71	109	100	96	86	67	50	
Breadth	50	36	36	37	36	34	32	24	microns.

Wings long, membrane projecting far beyond the tip of the abdomen, light brown, nearly clear at the base; fringing hairs long and slender, 13 to 18 interlocated ones.

Male not seen.

Larvae deep, orange red with antennae, legs and tube brown.

Described from three winged females and numerous apterous ones and larvae. Collected from phylloxera galls on hickory at Syracuse, N. Y., September, 1919, by Prof. Carl J. Drake, and under the bark of black locust trees in October, 1920, by Miss Evelyn Osborn.

Type in the author's collection; paratypes in the National Museum, the collection of the Brooklyn Entomological Society, and of the N. Y. State College of Forestry.

Trichothrips salicis n. sp.

Female. General color dark brown; tarsi and antennal segment 3 light brown. *Measurements:* Total body length 2.8 mm.; head—length 0.38, breadth 0.28 mm.; prothorax—length 0.24 mm., breadth 0.52 mm.; mesothorax—breadth 0.53 mm.; abdomen—greatest width 0.64 mm.; tube—length 0.28 mm., width at base 0.10 mm., at apex 0.05 mm. Antennae—segment 1, 48; 2, 72; 3, 118; 4, 100; 5, 100; 6, 90; 7, 53; 8, 53 microns. Total length 0.62 mm.

Head about 1.3 times as long as wide, cheeks slightly arched, bearing minute setae. *Eyes* small, occupying about .2 the length of the head. *Ocelli* minute, posterior pair opposite the anterior third of the eyes. Antennae about 1.6 times the length of the head. Third antennal segment noticeably longer than any of the others, 7 and 8 of about equal length, but varying even in the same individual. *Mouth cone* rounded at the apex, reaching two-thirds across the prosternum.

Prothorax considerably shorter than the head; posterior angles well rounded, a pair of stout spines on the coxae. Fore femora but slightly enlarged. Fore tarsus without a tooth.

Pterothorax subrectangular, sides arched. Wings wanting.

Abdomen short and thick; tube moderately long and slender. Bristles prominent on only the last two abdominal segments, almost colorless.

Male similar to the female, but smaller. Measurements: total body length 1.8 mm.; head—length 0.33, breadth 0.24 mm.; prothorax—length 0.21 mm., breadth 0.38 mm.; mesothorax—length 0.24, breadth 0.43 mm.; abdomen—greatest width 0.50 mm.; tube—length 0.21, width at base 0.07, at apex 0.04. Antennae—segment 1, 48; 2, 67; 3, 100; 4, 91; 5, 81; 6, 72; 7, 53; 8, 44 microns; total length 0.50 mm. *Fore tarsi* with heavy, almost straight spines. *Post-ocular* bristles slender, projecting beyond the eyes. Terminal bristles shorter than the tube.

Described from a single female and a single male collected from willow at Cranberry Lake in the Adirondacks by Prof. Carl J. Drake in July, 1919. *Types* in the author's collection.

Agrees with *T. fuscicornis* Hood in the unarmed fore tarsi of the female and the pedicellate 8th antennal segment, but differs in the length and color of the third segment and in the 7th not being noticeably shorter than the 8th.

KEY TO THE SPECIES OF TRICHOTHRIPS OF NORTH AMERICA.

1 (6) Prominent spines on body with blunt or dilated tips; most forms very dark brown or nearly black (except *T. angusticeps*), usually with short wings (except *T. longitubus*).

2 (3) Each fore tarsus armed with a tooth; antennae about 1.7 times as long as head; total body length about 1.5 mm. *T. angusticeps* Hood ('08).

3 (2) Fore tarsi not armed; antennae about twice as long as head.

4 (5) Wings fully developed; body length about 1.8 mm.; tibiae, tarsi, and intermediate segments of the antennae bright lemon yellow; tube fully as long as the head. *T. longitubus* Hood ('08).

5 (4) Wings short; body length about 1.2; whole antenna clear yellow; tube about half as long as the head. *T. brevitubus* Watson ('18).

6 (1) Prominent spines on body acute; antennae about twice as long as head.

7 (10) Individuals small, about 1 mm. in length, without ocelli or wings.

8 (9) Eyes reduced, lateral profile showing but three facets; first segment about half as long as the second. *T. smithii* Hood ('09).

9 (8) Eyes small, but normal; first antennal segment nearly as long as second .... *T. flavicauda* Morgan ('13).

10 (7) Individuals rather large, 1.5 mm. or more, wings fully developed or brachypterous.

11 (22) Each fore tarus armed with a tooth.

12 (13) Antennae 1.75 times as long as head; tube .7 as long as head; total length about 2 mm., fore tarsi with a short, stout tooth .... *T. ambitus* Hinds ('02).

13 (12) Antenna slightly more than twice as long as the head; tube slightly shorter than head.

14 (15) Total body length about 1.7 mm.; fore tarsi with a small acute tooth; wings light gray brown, spotted with darker.
T. americanus Hood ('08).

15 (14) Tarsi with a large tooth.

16 (17) Last two antennal segments completely united; eyes very small; body length about 1.5 mm.
T. anomocerus Hood ('12).

17 (16) Last two antennal segments not compactly united; eyes normal; body length 1.8 mm. or more.

18 (19) Tarsal tooth straight.
T. marginalis Hood & Williams ('15).

19 (18) Tarsal tooth curved.

20 (21) Body length 2.8 mm.; head dark brown. . *T. drakei* n. sp.

21 (20) Length 1.9 mm.; head yellowish.
T. terminalis Hood & Williams ('15).

22 (11) Tarsi unarmed.

23 (24) Color ochraceous yellow. . . . . *T. zonatus* Hood ('14).

24 (23) Color blackish brown.

25 (26) Antennal segments 2–5 subequal, 7 shorter than 8.
T. fuscicornis Hood ('16).

26 (25) Segment 3 elongated, 7 and 8 subequal. . . *T. salicis* n. sp.

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Cryptothrips adirondacks n. sp.

Body color uniform dark brown, almost black, tarsi and antennae lighter brown. Measurements: Total body length 2.25 mm. (2.00 to 2.5 mm.); head—length 0.28 mm., breadth 0.19 mm.; prothorax—length 0.14 mm., breadth 0.33; abdomen—greatest breadth 0.41 mm.; tube—length 0.24 mm., width at base 0.08 mm., at apex 0.04 mm. Antennae—total length 0.45 mm.; segment 1, 44; 2, 52; 3, 82 (72 to 94); 4, 85 (81 to 90); 5, 72 (62 to 82); 6, 63 (53 to 73); 7, 55; 8, 35 microns.

Head 1.5 times as long as wide; cheeks slightly arched, quite markedly constricted posteriorly, bearing a few short sparse hairs; dorsal surface striated; vertex swollen into a prominent rounded protuberance which occupies the entire space between the eyes and bears the anterior ocellus at the apex; *post-ocular bristles* about as long as the eyes, dilated into a small colorless head; *eyes* large, protruding, not produced on the ventral side, occupying nearly a third the length of the head, dark brown, anterior half of the inner margin nearly straight; *ocelli* large, posterior pair situated well forward, opposite the anterior ¼ of the eye whose margins they do not touch; *mouth cone* rather long, reaching two-thirds the distance across the prosternum; *antennae* 1.5 times the length of the head; segment 1 dark brown; 2, lighter; 3 and 4 yellow; remainder light yellowish brown, darker apically.

Prothorax small, length only about half that of the head; breadth, including coxae, about equal to the length of the head; surface reticulated; posterior angles well rounded and bearing each a single, medium heavy spine whose end is dilated into an inconspicuous knob; somewhat longer spine on each coxa; *legs* rather slender, almost as dark as the body; *tarsi* a lighter brown; *fore femora* but little enlarged and *fore tarsi* unarmed.

Pterothorax considerably wider than the prothorax; *wings* rather weak, membrane clear except at the extreme base, constricted in the middle, fringing hairs long, 5 to 14 interlocated ones.

Abdomen long and slender.

Male similar to the female, but smaller.

Larvae very long and slender; black with reddish hypodermal pigmentation.

Described from numerous females collected from willow and *Viburnum alnifolium* at Cranberry Lake, N. Y., July, 1919 and 1920, by Prof. Carl J. Drake.

Type in the author's collection; *paratypes* in the National Museum, in the collection of the Brooklyn Entomological Society, and that of the N. Y. State College of Forestry.

Idolothrips fuscus n. sp.

General color dark brown, with much bright red hypodermal pigmentation on thorax and abdomen. *Measurements:* Total body length about 4 mm. (3.5 to 4.6 mm.); head—length 0.61, breadth 0.29; prothorax—length 0.16, breadth across the coxae 0.52; pterothorax—greatest breadth 0.63; abdomen—greatest breadth 0.64; tube—length 0.55, width at base 0.115, at apex 0.07 mm. Antennae—total length 0.66 mm.

Segment	1	2	3	4	5	6	7	8	
Length	72	82	168	145	137	114	64	70	
Breadth	55	45	50	52	47	44	36	23	microns.

Head a little over twice as long as broad; cheeks nearly straight and parallel, but bulging a trifle near the base, contraction at the extreme base and behind the eyes barely perceptible, roughened with numerous short wart-like swellings and sparsely provided with medium-sized bristles; dorsal surface minutely striated; post-ocular bristles situated far behind the eyes, longer than the eyes but pale and inconspicuous, an equally long bristle in front of each posterior ocellus; other bristles short; *eyes* small, not protruding, dark, facets small, distance across the eyes the smallest diameter of the head except for a minute constriction immediately behind them; *ocelli* small and inconspicuous, anterior one situated on the projection between the bases of the antennae, posterior pair opposite the middle of the eyes and close to their margins; *mouth cone* short and rounded, reaching about the middle of the prosternum; *antennae* almost uniformly brown, nearly as dark as the head, apex of segment 2 a little lighter brown, extreme apices of segments 3–5 very light yellow, almost colorless; segment 1 cylindrical, 2 cup-shaped, constricted to a wide "neck" above the base and curved outward, 3–5 clavate, 6 and 7 sub-cylindrical, their apices extended over the bases of the segment in front, 8 lanceolate, bristles brown, rather long, sense cones colorless, rather short.

Prothorax much shorter than width of head, three times as wide as long; no prominent median groove; surface faintly reticulated; one of the two bristles at each posterior angle longer than the prothorax, curved; two pairs along the posterior border, the outer but little shorter than those at the angles, the median much shorter; a short, curved bristle at each anterior angle, and two pairs along the anterior margin of which the inner are longer.

Pterothorax considerably wider than the prothorax, subrectangular; sides slightly convex and converging posteriorly; destitute of long bristles; *legs* rather long and slender; mostly concolorous with the head, the extreme bases of the femora, the inner side of the apices of the femora, and the tarsi a little lighter brown; fore femora not at all thickened; fore tarsi with a very small, acute, forward-directed tooth on the inner side at the tip; *wings* short, generally reaching only to the fifth or sixth abdominal segment, but the colorless membrane is broad, on the fore pair the colorless median vein reaches about to the middle, fringing hairs long, on the fore wing double for about 34 (26 to 36) hairs.

Abdomen about as wide as pterothorax, long and slender, sides nearly parallel to 5th or 6th segment and then rather abruptly contracted; anterior segments destitute of conspicuous bristles but the posterior bearing progressively longer ones, those on segment 9¾ as long as the tube; tube long and slender, sides almost parallel for three-fourths of its length and then abruptly converging; terminal bristles less than half as long as the tube.

Male unknown.

Described from four females collected from old burrows of a cerambycid in a twig of basswood at Syracuse, N. Y., October, 1920, by Prof. Carl J. Drake, and a single female collected at Sherbon, Mass., May 10, 1919, by Mr. C. A. Frost. *Type* in the author's collection; *paratypes* in the collections of the N. Y. State College of Forestry and of the Brooklyn Entomological Society.

Close to *T. armatus*, but differing in the shape of the head, shorter prothorax, color of the antennae and numerous minor characters.

In addition to the new species described above, the following establish apparently new locality records:

Aeolothrips fasciatus L. Cranberry Lake, N. Y., June 5, 1920. C. J. Drake, Coll.

Hoplothrips magnafemoralis Hinds (=*Acanthothrips magnafemoralis* Hinds). In the top of a fallen maple tree. Cranberry Lake, N. Y., July, 1920. C. J. Drake, Coll.

Hoplothrips corticis Serville (=*Acanthothrips nodicornis* Reuter). With the last.

There seems to be no published description of the larvae of these species. The larvae of both species are bright red, but those of *corticis* are a deeper red. In this species the color extends into the legs, except the tarsi, the entire tube, and even the first and second antennal segments. In *magnafemoralis* there is much less red pigment in the head, little in the legs and that mostly in the coxae, and the last abdominal segment is free of red pigment; the second abdominal segment is lighter in color, often distinctly yellow, and forms a conspicuous band. In this species the anterior angles of the head are produced over and between the bases of the antennae and the eyes into striking horns which considerably exceed the first antennal segment. These horns are curved and incompletely divided by a constriction near the middle. From the apex of the basal section arises a large, colorless, blunt bristle which extends beyond the horn. This horn-like extension is absent from the larvae of *corticis*.

FOODPLANT OF LUPERINA PASSER GN. (LEPIDOPTERA).

By George P. Engelhardt, Museum, Brooklyn, N. Y.

It appears that nothing has been published regarding the foodplant and habits of this rather common moth.

The larva is a borer in the roots of *Rumex verticillatus* and probably other species of this group of plants. It hibernates within its gallery, continues feeding for a short time in the spring and attains full growth (1½ inches) early in May. The head, neck- and anal-shields are chestnut brown; otherwise it is dull white. When ready to pupate, the larva leaves its burrow to construct a slight cocoon within the adjoining soil. The pupa is glossy, light brown. One imago, female, obtained out of three pupae, emerged May 22, 1921. The larvae were collected along the margin of a stream near Hempstead, Long Island, N. Y., during the latter part of April.

ON THE GENUS MICROVELIA WESTWOOD (HEMIPTERA, VELIIDAE).

By H. M. Parshley, Smith College, Northampton, Mass.

(Contributions from the Department of Zoology, Smith College, No. 84.)

A thorough monographic treatment of the American species of *Microvelia* is a great desideratum, but this can hardly be accomplished until the type specimens of Champion and Uhler are carefully examined and the wingless phases of several species made known. In fact, the complete elucidation of *marginata* Uhler, *robusta* Uhler, and *albonotata* Champion will probably involve the study of further collections from Central America and the West Indies. Thus in connection with notes on two recently described species, I think that it will be useful to offer some observations on the genus, including a descriptive synopsis based largely on new characters, by which most of the species reported from the Eastern States may be readily distinguished in the apterous condition. The macropterous forms, relatively very rare, may, as a rule, be easily associated with their apterous phases by correspondence in size and in antennal and genitalic characteristics.

The structure of the thorax in the Gerridae and Veliidae is curiously and diversely modified, and there is here an opportunity for an extensive and thorough morphological investigation, although Bergroth, Kirkaldy, and others have published something on the subject. In Microvelia the apterous thorax is very peculiar and has been much misunderstood. The pronotum is relatively long on the median line and bears either a distinct transverse linear impression (*americana* and *borealis*) or one or two rows of punctures. The mesonotum is much shorter than the pronotum when visible, or it may be entirely concealed beneath the pronotum. In his paper on the European species of Microvelia (Note sur les deux Microvelia d'Europe. Ann. Mus. Nat. Hungarici, XIV: 68–71, 1916, 2 figs.) Horváth makes use of these modifications in the mesonotal structure to distinguish the two species, and both conditions are illustrated by American forms, for in *fontinalis* (fig. 3) the mesonotum is concealed as in *pygmaea* (Dufour) Horv., while the rest of the species noticed below, with one exception, have the other type of structure, like

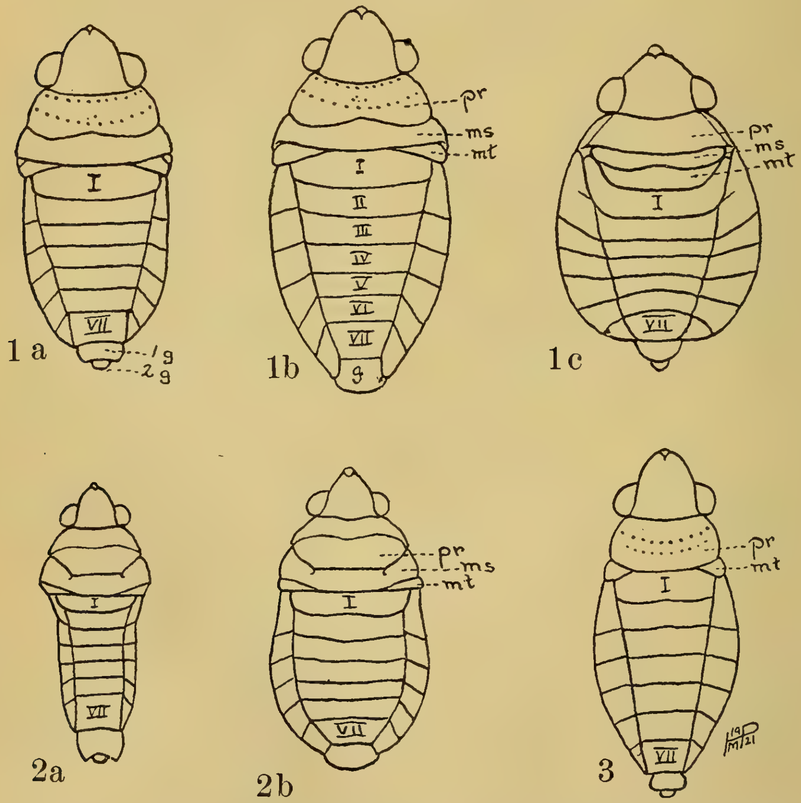
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FIG. 1. *Microvelia hinei* Drake.—*a,* male; *b,* female; *c,* nymph. (x 40.) FIG. 2. *M. borealis*—*a,* male; *b,* female. (x 20.) FIG. 3. *M. fontinalis*—male. (x 17.) I–VII, dorsal abdominal segments; *pr,* pronotum; *ms,* mesonotum; *mt,* metanotum, metanotal triangles; *g,* genital segment.

reticulata (Burmeister) Horv. (cf. fig. 1a). The metanotum is always concealed at middle, appearing on each side as a small triangular area, which I propose to term the metanotal triangle. These triangles are widely different in shape in the different species, as the figures show, and thus they furnish taxonomic characters of great value. In the nymph (fig. 1c) the metanotum is not concealed at middle. The segment immediately following, which has often been treated as the metanotum, is in reality the first dorsal segment of the abdomen, which thus has seven segments, exclusive of the genital segments.

M. atrata is peculiar in having minute vestigial wings, and the pronotum is correspondingly enlarged, approaching somewhat the condition characteristic of the winged forms. It is produced posteriorly, so that it covers not only both mesonotum and metanotum, but also the median portion of the first abdominal segment.

The structure of the tarsi has likewise been variously interpreted. In all the American and exotic species which I have been able to examine there is agreement in the number of tarsal segments in the adult stage; all have the front tarsi with one segment, the middle and hind with two, or, as it is briefly expressed, the tarsal formula is 1:2:2. I do not think that the minute enlargement or "node" which may be perceived (with difficulty) at the base of the first tarsal segment can be considered as a true segment, because this node appears to be nothing more than a slight basal swelling of the metatarsus when the leg is cleared and examined under very high magnification. When it is counted, as by Champion in the "Biologia," the tarsal formula becomes 2:3:3, and the species remain uniform in this particular. The subgenus *Kirkaldya* Torre-Bueno was founded on the supposition that *americana* differed in tarsal formula from the other species, and since there are no other characters to support it, it must be definitely suppressed. Van Duzee in his Catalogue of 1917 maintains this subgenus, although de la Torre-Bueno, in his later paper on the Veliinae of the Atlantic States (BULL. BROOKLYN ENT. SOC., XI: 52–61, 1916), makes no mention of it; however, in the table of species there given the tarsi are still made to vary, and therefore the matter must be called to the attention of students.

The rather numerous species of Microvelia, long neglected on account of their minute size and the deceptively immature appearance of the apterous adults, are now being rapidly made known, and it is becoming clear that they all have a wide distribution, at least in the region east of the Mississippi River. During June of the present year I met with two species recently described by Drake, *M. buenoi* (An undescribed water-strider from the Adirondacks. BULL. BROOKLYN ENT. SOC., XV: 19–21, 1920) and *M. hinei* (Water-striders new to Ohio. Ohio Jour. Sci., XX: 207, 1920), living in company with *M. albonotata* on a small campus pond at Northampton, Massachusetts. These appeared only in the apterous form, but I have since taken both apterous and winged phases of *hinei* at Cold Spring Harbor, Long Island, N. Y. The species last mentioned is remarkable for its beautiful coloration and extremely small size; in fact, I think it is the smallest known Microvelia. The following descriptive notes are presented to supplement the original description.

Microvelia hinei Drake. Fig. 1.

Wingless form.—Second, third, and fourth abdominal segments with narrow median yellow stripe, bluish laterally; fifth black, with median stripe; sixth and seventh bluish or yellowish, the median line narrowly black or brown, polished. In the darkest specimens the dorsal markings become very obscure.

Median impressed line of head not glabrous; antennae longer than head and thorax together on median line (27–25); first segment (7) stout, second (5) almost as thick as first, clavate, third (8) half as thick as second, almost linear, fourth (12) somewhat thicker than third, very slenderly fusiform, slightly shorter than distance between eyes (12–13); rostrum extending to front coxae. Thorax short, nearly three times as wide as long on median dorsal line; pronotum four times as wide as long, with a transverse curved row of punctures near anterior margin and one behind middle. Mesonotum visible, more than one-half as long as pronotum on median line, posterior margin nearly straight across middle. Metanotal triangles each about one-third as long as width of mesonotum. First and second abdominal segments about equal in length, third to sixth about equal, each slightly shorter than second, seventh longest, but shorter than broad.

Connexivum rather broad, often strongly reflexed. Legs rather short and stout, the posterior femora barely reaching genital segment.

Male (fig. 1*a*).—General form oblong oval (when connexivum is not much reflexed); lateral margins of connexivum straight in anterior half; seventh abdominal segment almost rectangular, distinctly emarginate posteriorly; second genital small, hemispherical, half as long as first (as seen from above). Length 1–1.3 mm.

Female (fig. 1*b*).—General form oval, slightly broader than male; connexivum rarely reflexed, its lateral margin evenly curved; seventh abdominal segment trapezoidal, its anterior margin longer than the posterior (10–6); dorsal genital segment transverse, rectangular, shorter than the preceding. Color pattern usually more brightly developed than in the male. Length 1.3–1.6 mm.

In antennal structure this species is somewhat similar to *buenoi* Drake, but otherwise it is not closely related to any of the described species. Aside from size and coloration, it is peculiar in its thoracic structure, lack of striking sexual dimorphism (cf. figs. 1 and 2), and genital characteristics. The winged specimens found on Long Island agree perfectly with Drake's description. At Northampton the nymphs of the apterous form were numerous, apparently in the last instar.

Nymph (fig. 1*c*).—Velvety brown, brightly marked with yellow. Head with two broad, longitudinal, dull yellow stripes; median line of thorax and abdomen yellow, broadest on first abdominal segment; mesothorax, lateral portions of metathorax, lateral margins of whole thorax, and connexivum anteriorly, yellow; connexivum brown posteriorly, with yellow spots inwardly; sixth and seventh abdominal segments pale.

Antennae stouter than in adult; the first, second, and fourth segments equally thick; the third more slender and nearly cylindrical; proportions—6: 3: 5: 10. Pronotum very broad (27–6), nearly straight posteriorly across middle, the disc with a faint postmedian row of punctures. Mesonotum very short, its posterior margin strongly sinuate. Metanotum somewhat longer than preceding segment, fully exposed across middle, its posterior margin nearly straight, curved forward laterally. First abdominal segment large, much longer than second, about as long as seventh. Connexivum very broad, only slightly reflexed, continuous anteriorly with the distinctly margined sides of thorax, which extend to eyes. Form broadly oval. Genital segments prominent. Length about 1.2 mm.

The interpretation of the thoracic structure given above was arrived at by careful comparison with the adult anatomy, and I think it is correct; but the matter will bear further investigation and the attention of students is invited to it.

TABLE OF APTEROUS FORMS.

This key includes all the species recorded from the eastern part of North America, excepting *marginata* Uhler and *robusta* Uhler, which were described from the West Indies and may not in reality occur on the continent; moreover, I believe that their wingless forms have not been made known. The color characters given are general, not detailed, and pertain chiefly to the dorsal aspect. The first form noticed in the key is not strictly apterous, as it possesses very minute vestigial wings, but it is included here since the species appears also in the fully winged condition.

1. Pronotum largely developed, strongly arcuate and produced posteriorly, reaching base of second abdominal segment; minute white wing-pads present, projecting from under pronotum at lateral angles; first abdominal segment visible only at sides; color velvety brown, pronotum anteriorly with a transverse yellow mark, connexivum dull yellow exteriorly; length about 1.7 mm......*atrata* Torre-Bueno.

Pronotum reduced, not much produced posteriorly, reaching at most to base of first abdominal segment; wings entirely absent; first abdominal segment fully exposed..........2.

2. Mesonotum concealed by pronotum; metanotal triangles almost obtuse, extending inwardly much less than one-third the width of the body at their level (fig. 3); entire thorax on median line less than twice as long as first abdominal segment; body strongly pilose; color dark brown, the anterior portion of pronotum, first abdominal segment, and connexivum variably pale; abdomen marked at base and apex with patches of fine bluish gray pubescence, variably conspicuous; length about 2.3 mm....*fontinalis* Torre-Bueno.

Mesonotum visible; metanotal triangles very acute, longer (cf.

fig. 1*a*); thorax longer as compared with first abdominal segment .... 3.

3. Pronotum with a distinct transverse linear impression before middle (cf. fig. 2*a*) .... 4.

Pronotum without the linear impression, often with one or two transverse rows of punctures (cf. fig. 1*a*) .... 5.

4. Abdomen ornamented dorsally with conspicuous patches of silvery pubescence; hind tibiae similar in male and female; color dark brown, a transverse mark on anterior lobe of pronotum and a spot on each connexival segment dull yellowish; length about 2.3 mm........... *americana* Uhler.

Abdomen without silvery pubescence; hind tibiae bent in male; color black or brown with grayish markings more distinct in female than in male; length about 1.8 mm. (fig. 2). *borealis* Torre-Bueno.

5. Length about 2.3 mm.; surface shining, very minutely pubescent; antennae very long and slender, the fourth segment twice as long as distance between eyes; color yellowish brown, variably marked with black. . *albonotata* Champion.

Length less than 2 mm.; pubescence more strongly developed, though short, surface dull; fourth antennal segment about as long as distance between eyes .... 6.

6. Pronotum about three times as long on median line as mesonotum; abdomen with conspicuous tufts of silvery pubescence; third antennal segment slenderly clavate, slightly longer than second (6–5); color black, anterior lobe of pronotum yellowish, abdomen with dull grayish patches; length about 1.7 mm........................ *buenoi* Drake.

Pronotum not twice as long as mesonotum; abdomen without silvery pubescence; third antennal segment almost linear, much longer than second (8–5); color light to dark brown, with black, yellow, and bluish markings; length 1–1.6 mm. .... *hinei* Drake.

THE NUMBER OF ANTENNAL SEGMENTS IN GALL MIDGES AND A NEW SPECIES.

By E. P. Felt, State Entomologist of New York, Albany, N. Y.

The normal number of antennal segments among generalized Nematocera is probably 16—that is, a greater or a smaller number means specialization by addition or reduction. The remarkable Mexican *Ceratomyia* Felt has only six antennal segments. Most gall midges have 14 antennal segments, a limitation almost invariably true of the large series belonging to the sub-tribe Itonididinariae, though *Hormomyia* with *Oligotrophus* affinities contains a few species with as many as 25 or 26 segments, the flagellate binodose in the male and 20 to 24 at least in the female. Early writers counted each enlargement in the Diplosid male antenna as a segment and this introduces a possible confusion not always readily eliminated.

The Asphondyliariae, like the Itonididinariae, show relatively little variation in the number of antennal segments, while in the Dasyneuriariae and the Oligotrophiariae there are numerous variations, the extremes ranging from 9 to 26 segments. It is noteworthy in these latter two tribes that the larger species as a rule have the greatest number of antennal segments.

The Lasiopteriariae, a sharply delimited and rather highly specialized tribe, show a great diversity in the number of antennal segments, this ranging from 10 or 12 in *Clinorhyncha* H. Lw. to 39 in one species of *Lasioptera* Meign.

An Australian species, *Lasioptera nodosae* Skuse, held the record for the greatest number of antennal segments (34) till the discovery in the U. S. National Museum collections of the species described below, which has the astonishing number of 39, a total exceeding anything heretofore recorded for the tribe and probably for the entire family.

Lasioptera howardi n. sp.

The species described below was reared February 10, 1883, by Mr. Theodore Pergande, from a lot of elongate, oval twig galls found on scrub oak, some of them collected January 3, in Pine Cañon, Mount Diablo, Contra Costa County, Calif., and some from apparently the same species of oak at Martinez, Calif., received January 13, 1883, from H. W. Turner. It is a pleasure to name this insect in honor of Dr. L. O. Howard. This species has the third vein uniting with the anterior margin at the basal half, 39 antennal segments, dark tarsi, annulated with white and a cluster of numerous slender, spoon-like hooks on the lobes of the ovipositor.

It is related to two other oak midges, both with an unusual number of antennal segments, namely, *Lasioptera querciperda* Felt, which has the third vein uniting with the anterior margin of the wing at the basal third, 28 antennal segments, the tibiae and tarsi mostly reddish or dark brown, unbanded and a cluster upon the lobes of the ovipostor consisting of two exceptionally heavy and many very slender hooks, and *L. querciflorae* Felt, which has the third vein uniting with the anterior margin at the basal half, 33 antennal segments, yellowish or yellowish brown, unbanded, and a cluster on the lobes of the ovipositor consisting of numerous very slender hooks.

The following description is based upon a specimen mounted in a balsam slide in the National Museum collection and labeled 3–2–19, No. 2972 °3, February 10, '83. The structural characters are taken from the preparation and the colorational features drafted from Mr. Pergande's notes, the whole being kindly placed at our disposal by Dr. Howard.

> Female: Length 1 mm. Antennae extending to the second abdominal segment, sparsely haired, dark brown, 39 segments, the fifth with a length about ¾ its diameter; terminal segment somewhat produced, with a length a little greater than its diameter and tapering to a broadly rounded apex; palpi, first segment with a length nearly three times its diameter, the second a little longer, more slender, the third a little longer than the second, more slender, the fourth about ⅓ longer than the third, more slender. Color when living as follows: "Thorax, underside, abdomen, femora, base of wings and halteres cinnamon brown covered with a whitish pubescence, upper side of thorax with medial two lateral darker lines—three lines freer from pubescence than other portions of the body, wings with costa black except a small whitish spot about midway to apex. Upper side of abdomen black with two large triangular spots of gray upon each segment. Legs and antennae dark with whitish pubescence, former annulated at joints with white." (Pergande.)

In addition, it may be stated that the basal abdominal segment appears to be white as in related species, and the preparation does not very satisfactorily justify the white annulations unless the latter are restricted mostly to the femoro-tibial and the tibiotarsal articulations. The ovipositor is presumably as long as the abdomen when extended, the terminal lobes somewhat irregular, with a length over twice the diameter and the dorsum thickly set with long, rather slender spoon-like, chitinized processes; claws moderately heavy, strongly curved, unidentate; the pulvilli as long as the claws. Type in U. S. National Museum.

COLLECTING NOTES.

By E. L. Bell, Flushing, N. Y.

While collecting in a glade on the side of a road running through the woods near Kings Park, Long Island, N. Y., one day during the latter part of July I was struck by the great number of robber flies infesting the spot, and was particularly interested in their activity in capturing various insects on the wing and their remarkable dexterity in the chase.

I saw one of those common little butterflies, *Phyciodes tharos* Drury, lazily flying through the tops of the grasses, and as it passed a small sumac bush a robber fly, *Asilus sericeus* Say, suddenly darted out of the bush and pounced upon it as it flew along; and so rapidly was it all done that the little butterfly just seemed to melt away in a blur before my eyes. The robber fly did not fly far, but alighted about ten feet away, where I captured it and its prey. The butterfly was quite dead when taken, although probably not much over a full minute had elapsed between its own capture by the fly and the capture of both by myself in turn.

Another incident occurred a short distance from the one just related; this time the victim was a *Strymon titus* Fabricius. I saw the butterfly fly in back of a small sumac bush, and as it did not appear on the other side assumed that it had alighted. As I wished to capture it, I went to the spot and stood looking to see if I could see it anywhere on the leaves of the bush or the surrounding vegetation. As I was quite sure that it must be there, I was puzzled in not being able to locate it anywhere on the leaves. After several minutes, low down in the grass I saw a robber fly with something in its grasp. Upon capturing it, the something proved to be the *Strymon titus,* not only quite dead, but with all of its legs torn off except the right fore leg. The robber fly in this instance was also the same species as the one just mentioned.

I observed this and other species of robber flies capture many flies, but their prey was not confined entirely to such soft-bodied insects as have been already mentioned, for I saw another robber fly carrying its prey off, and upon following and capturing it the victim proved to be one of the common beetles—*Typocerus velutinus* Oliv.—which was dead; although I do not know how long the robber fly had had it, as I did not see its capture, the beetle had just been killed, as it was quite limp. It would seem that a hard-bodied insect of this character would make quite a tough proposition for a robber fly to tackle. The fly in this case was *Dasyllis thoracica* Fabricius.

Probably the principal reason why so many robber flies infested this particular spot was the fact that there were many sumac bushes there in full bloom, and their flowers attracted swarms of insects, butterflies, flies and beetles; and these in turn attracted the robber flies.

While collecting at Flushing, Long Island, N. Y., in August, I noticed an *Epargyreus tityrus* Fabricius perched on a red clover flower in a very unnatural position. Investigation proved it to be dead and a small white spider, marked with maroon and olive green, *Misumena vatia* Clerk, had it in its grasp. Its head was at the butterfly's throat and its long front legs grasped the forward part of the thorax, while with its shorter hind legs it clung to the flower, from which it was with difficulty removed to the killing bottle, and not until the cyanide fumes began to affect it did it loosen its hold on the butterfly. This small spider was so much inferior in size to the butterfly that it is amazing indeed that it was able to grasp and hold, until it could kill it, such a robust and strong flying butterfly as *Epargyreus tityrus,* unless it injected into the butterfly some powerful secretion which quickly benumbed it and stilled its struggles.

EDITORIAL.

OUR NEW DRESS.

Our new dress has doubtless been the first thing to strike *you* about this number. It is not alone more simple; it is likewise more practical and more economical.

Entomological publications must dedicate their funds to the last cent to the end for which they are devoted and this is one way of doing it. It has at the same time seemed to us that as it is customary to bind the covers in with the number, it is more easily done, and makes a far better set-up book than the old practice of binding in stiff covers at the end of the volume. We will appreciate the helpful comment of all our readers.

In passing we may note that this change, together with the one mentioned below, will go far toward enabling us to maintain our standards of quality and quantity.

AUTHORS' CORRECTIONS.

The printer's bill is almost like the plumber's—when you think it is down to bed-rock, you run across "Authors' Corrections, $17.83." And the poor editor wonders—but there it is!

This has a very serious aspect. Everybody knows printers' prices are now higher than ever. In consequence, our highly technical scientific magazines, with small subscription lists, must save at every step. One obvious item to cut out of the cost of printing is "authors' corrections."

Pursuing this end, much as we dislike it, we are compelled to charge back to authors of papers any items for corrections caused by changes they make in their papers in the galley proof, which are not to rectify typographical errors made by the compositor.

To avoid this charge, all authors favoring this BULLETIN with their work are asked to send in their papers in final shape and correct exactly as they wish to see them published. If papers are not completely finished when sent to us, authors either must forego improvements and additions to papers in proof or else meet the cost of making them.

THE IMPORTANT FAUNAL LIST.

A treatise on geometry is for the benefit of him who has progressed to a state of learning where he can grasp its fundamental principles. It is not to be written down to a multiplication table standard. This is precisely the case with any catalogue of insects—it should exhibit the status of the science at the time of writing and should not defer to any inferior or obsolescent standard.

A biological catalogue of forms has three requisites, without which it loses its value as a scientific document. These are: Correctness in nomenclature; exactness in references; and fulness of distribution. But *accuracy* in all three is the keynote; without it the labor is vain.

Records of distribution should likewise have these same three characteristics, for it is of as great importance to record distribution and occurrence reliably as it is to describe species. It is on such records that we build our catalogues. Moreover, these records are of especial importance now in this country, for the encroachments of the cities upon the country, the subjugation of the soil to agriculture, the drainage of marshes, the destruction of forests, and all the endless efforts of man to change the face of nature and disturb its equilibrium are all in progress. These efforts to dominate nature are necessarily bound to change the fauna, in the same degree that its basic form of sustenance in the plant kingdom changes. For example, take the great destruction of the chestnut trees in recent years caused by disease. Can it be gainsaid that this not only will, but already has, caused the disappearance of sundry insects which the chestnut tree harbored and nurtured, such as the chestnut weevil? Conservation and modern forestry methods, by eliminating dead, dying and unsound trees, will rapidly restrict and diminish in this country the group of the Aradidae, the myriad beetles and other dwellers under bark of dead trees.

Is it not as well to know what forms once peopled any given area?

This last purpose is fulfilled by faunal lists, many of which rise above mere enumerations of names and contain many unrecorded biological and ecological facts, thereby adding, fractionally to be sure, but none the less positively, to our meager store of knowledge. These lists frequently serve as a sort of assay-piece or apprenticeship to catalogue writing, since no carefully prepared list is a mere slap-dash, hodge-podge concatenation of names, but rather is the result of a certain amount of careful research in the matter of classification, nomenclature and distribution.

The fact that the faunal list as such has had eminent advocates—among hemipterists such men as Osborne, Van Duzee, Uhler, and other lesser lights—is evidence not only of its usefulness, but of its importance as well.

MANUAL OF THE HEMIPTERA OF EASTERN NORTH AMERICA IN PREPARATION.

The special studies of the undersigned have now reached the point where it seems possible to produce an extensive and approximately complete work on the Hemiptera (Heteroptera) of the eastern portion of the continent, and rapid progress is now being made on it. It is intended that the work will not only provide the means for the identification of the species, but also include full treatment of the biology and literature of the group. The authors will be glad to receive collections for study and identification.

H. G. Barber,
H. H. Knight,
H. M. Parshley,
J. R. de la Torre-Bueno.

BOOKS.

CATALOGUE OF THE COLEOPTERA OF AMERICA, NORTH OF MEXICO. By Charles W. Leng. (Published by John D. Sherman, Jr., Mount Vernon, N. Y., 1920.) One volume, large octavo, of x + 470 pp., with one chart.

It is a great pleasure to have the privilege of introducing to the readers of this BULLETIN the eagerly expected catalogue of North American beetles written by Mr. Charles W. Leng, for many years one of the most active members of the Brooklyn Entomological Society. Only those who have attempted work along similar lines can fully appreciate the tremendous amount of painstaking labor which Mr. Leng must have devoted to listing some 30,000 references scattered in upward of 4,000 papers published in Europe as well as in this country. Furthermore, it takes a specialist of long experience to find his way so skillfully in the almost inextricable maze of synonymy. Considering that in coleopterology, perhaps more than in any other branch of entomology, the descriptive mania seems to have had unchecked sway, we are not surprised to read in the Preface that "No attempt has been made to determine the validity of the numerous specific names proposed by recent authors."

The aims and preferences of the various students in this field are so diversified that any one courageous enough to tackle the subject could not well be expected to satisfy more than a portion of them. The collector, the taxonomist, the student of phylogeny and geographic distribution, the ecologist, the economic entomologist—each has his own point of view, which he only too readily considers paramount. But Mr. Leng has been particularly successful in appealing to all and was fortunate in enlisting the help and criticism of the leading North American coleopterists whose names appear in the Preface. Perhaps I may be permitted to make special mention here of the untiring assistance which the author received from Mr. Andrew J. Mutchler, of the American Museum of Natural History. A number of specialists assisted in drawing up the lists of certain families: Mr. A. B. Wolcott, the Cleridae; Messrs. A. S. Nicolay and W. J. Chamberlin, the

Buprestidae; Mr. C. Schaeffer, the Ostomidae; and Mr. J. M. Swaine, the Scolytoidea. Mr. J. A. Hyslop helped in the arrangement of the families of Elateroidea. The text for the water beetles was prepared by Mr. J. D. Sherman, Jr., and that for the family Melandryidae by Mr. L. B. Woodruff.

In spite of the fact that catalogues of this kind have sometimes been referred to as "compilations"—even by persons who usually keep them within easy reach for reference purposes—the present work has distinct originality, especially evident in the introductory essay on classification. Under the modest title, "Explanation of Sequence of Families" (pp. 3 to 38), Mr. Leng presents a masterly review of the various systems of classification proposed for the Coleoptera in recent times, pointing out their salient features, their merits, and the objections urged against them. The earlier systems of Leconte, that of Sharp, and the so-called "phylogenetic" systems of Lameere, Ganglbauer, Handlirsch and Kolbe are in turn examined. The value of the genitalia and of larval characters as a basis for classification is also discussed. The general entomologist will be interested to read that "it seems too early in the study of Coleopterous larvae to attempt to draw any definite conclusions therefrom, except as a corroboration of those drawn from the study of adults," and that "alleged resemblances in the larvae have frequently been used to support relationships based primarily on adult characters; and if such resemblances are, at least in part, cases of convergence, even such may be hazardous." A similar conclusion might be drawn from the study of larval characters as known at present in the other holometabolous orders.

Mr. Leng believes that "bearing in mind the speculative character of the phylogeny of the Coleoptera, and the failure of any theory thus far advanced to reconcile all the facts of larval, adult and fossil studies, it would be premature to base any radical changes in Leconte's classification thereon." Thus, balancing one argument against another, he adopts a division into two suborders: the Adephaga, with the two superfamilies Caraboidea and Gyrinoidea; and the Polyphaga for the remainder of the beetles, including the Rhysodidae and Cupesidae, which certain authors place among the Adephaga. The Polyphaga are in turn sub-divided into seven series and twenty superfamilies. A conspectus of the 109 families of living Coleoptera represented in North America appears on p. 38 and the characters of the major groups are found in key-form on pp. 15 and 16.

Another part of the Introduction examines critically the sequence of families and major groups, with special reference to their probable phylogeny. The discussion is illustrated with a chart on which vertical lines indicate separations based respectively on the sutures, the venation, the larva, the palpi and the antennae, the left-hand columns being the most primitive; horizontal lines indicate separations based on the number of abdominal segments and number of tarsal joints, the most primitive being at the bottom of the sheet. When the families and most peculiar tribes are entered on such a chart, it is seen that—barring exceptions due to the survival of more primitive forms in certain series—their sequence proceeds in general from the lower left-hand corner to the upper right-hand corner—that is, from the most primitive in respect to the twelve important characters chosen to the most derivative. The succession of the superfamilies thus obtained, beginning with the Caraboidea and ending with the Scolytoidea, agrees in the main with that adopted for the Catalogue. There is, however, nothing dogmatic about Mr. Leng's position with regard to classification, as sufficiently shown by his concluding remarks (p. 38).

In the catalogue of the living forms of North American Coleoptera, which constitutes the bulk of the book (pp. 39 to 342) and is printed in double columns, the genera and species have been arranged in natural sequence in accordance with the most recent authoritative works. A mere alphabetic enumeration may present certain advantages, yet the arrangement adopted by Mr. Leng is much to be preferred, since a work of this kind is primarily intended as a guide to classification and proper ordering of the cabinet. A consecutive numbering has been adopted for all species described and so far unquestioned in print; letters *a*, *b*, etc., following the numeral indicate varieties, subspecies, races and other forms; disputed names are usually, and recognized synonyms are always, unnumbered. Names that can not at present be identified are listed at the close of each genus, set off by a dash; there are about 330 thus cited, mostly of older authors, such as Motschulsky, Mannerheim, and others. This number is remarkably small considering the amount of descriptive work that has been done by writers of very unequal standing both here and abroad.

Especial attention should be called to the system of reference, which strikes me as being very practical in cases where bibliographic information must be condensed as much as possible. Each scientific name is followed by that of its author (which is usually abbreviated) and by figures indicating the final two of the year in which the description was published, separated by a hyphen from the page on which the description occurs. These in turn refer to the chronological list of each author's papers at the end of the volume. The distribution is given in a general way and in abbreviated form. From the data thus presented it is evident that much remains to be done even in the Coleoptera before they can be safely used as a basis for zoogeographic speculation, for in most cases the published records indicate the distribution of the collectors rather than that of the insects. Species introduced into North America from foreign countries are so marked; they do not number more than 160, even including some doubtful cases, a surprisingly small figure when one considers the many possibilities of accidental dispersal of insects offered by present-day cosmopolitan commerce.

The last comprehensive work on the subject, Mr. Henshaw's Check List of 1885, contained 9,238 names regarded of specific value, and its supplement, published in 1895, brought this number up to 11,256. The present work lists 18,540 species, and even this figure gives no adequate idea of the activity of North American coleopterists during the last thirty-five years, for in addition there are recorded in the Catalogue innumerable forms which conservative authorities regard either as varieties or subspecies. Counting the synonyms, over 30,000 names are recorded by Mr. Leng.

The Strepsiptera are to be found in an Appendix (pp. 343–345). According to certain writers they form a distinct order, while in the opinion of others they are merely aberrant Coleoptera, considerably modified through their specialized parasitic habits.

A novel, and at the same time commendable, feature in this *Catalogue of North American Coleoptera* is the inclusion of fossil forms thus far described (pp. 349–365). This section was contributed by Prof. H. F. Wickham, who has made a specialty of the subject for the last decade. It contains 825 species, nine of which, from the Pleistocene, have been identified with living forms. The other 816 extinct species are from the following geologic ages: 4 from the Cretaceous; 129 from the Eocene; 579 from the Miocene; 1 from the Oligocene; 103 from the Pleistocene. These fossil remains have been collected from but 14 localities, most of which have yielded very few specimens. In fact, practically all the Miocene forms, or 70 per cent. of the names recorded in the list, were obtained from the celebrated shales of Florissant, Colorado, investigated with so much enthusiasm by Prof. T. D. A. Cockerell during the past fifteen years. It is of further interest that a very large number of these fossil species belong to genera still living nowadays either in the same zoogeographic region or in other parts of the globe; of 395 genera mentioned in the list only 91 (or 23%) are regarded as extinct types. If we restrict ourselves to the Miocene fauna of Florissant, the only locality sufficiently well explored to warrant general conclusions, we find that 73 (or 22%) of the 318 genera thus far recorded there still have representatives in North America. Only one family, the Paussidae, is not at present found on this continent, being now, with the exception of one South American genus, restricted to the Old World. What is more, these fossils, even from the Cretaceous and the Eocene, can without effort be included in the families based on living species. It is thus evident that the main lines of evolution in the order Coleoptera have undergone little, if any, change since the end of the Mesozoic times. This, together with the paucity of available data, accounts for the difficulty of using the geological record in connection with a phylogenetic system of classification of the order. Yet the past history of a group should afford the most convincing arguments for its suggested phylogeny.

The "Bibliography of Taxonomic Coleopterology to January 1, 1919" (pp. 367 to 444) is a contribution of great value in itself and would alone make this book an indispensable guide to the American coleopterist. The manner in which it is presented adds greatly to its usefulness. The writings of each author are arranged chronologically; the references to periodicals have not been abbreviated to the point of unintelligibility, while the number of pages covered by the article is given in each case, thus permitting an estimate of its probable importance. The title of each paper, though shortened, is of further help in this connection and will also aid considerably in locating the article in the library. About 4,000 titles of contributions by about 700 authors are recorded in this part of the work, which may safely be adjudged one of the most complete of its kind. Though it was the author's intention to list only the taxonomic papers, even a cursory examination shows that the scope is much wider, so that this bibliography will undoubtedly render great service to the student of ethology and to the economic entomologist also. It is apparent that practically all the writings of some of the leading North American specialists on the subject have been listed, and, if it were only from the point of view of numbers, the contributions of Mr. E. A. Schwarz, the Nestor of North American coleopterists, stand prominent.

An index (pp. 445–470) to the names of genera, subgenera and higher groups concludes the volume.

Mr. Leng is to be congratulated for having so successfully completed his tedious task, embodied in a volume that not only will be a useful reference work for many years to come, but also will stand out as a mile-stone in the progress of entomology. The editor, Mr. John D. Sherman, Jr., deserves full praise for the splendid manner in which the volume has been presented. Both the quality of the paper and the typographical execution are of the best. While the price of the volume ($10) may to some seem rather high for the modest purse of the average entomologist, it is, as a matter of fact, quite moderate considering present printing conditions, which would rapidly make entomological publications a financial impossibility were it not for the voluntary contributions of a few enthusiastic devotees.

J. BEQUAERT,
American Museum of Natural History.

PROCEEDINGS OF THE SOCIETY.

Meeting of December 16, 1920.—*Long Island Records.*—Mr. Engelhardt showed a collection of variations of *Utetheisa bella* Linnaeus, made last summer near Brooklyn, N, Y., by Mr. Mattes, a former member of the Society. He said that, perhaps due to moist conditions, last season seems to have been unusually favorable for the production of these variations. Mr. Davis exhibited a female of the larger chestnut weevil, *Balaninus proboscideus* (Fabricius), collected at Kings Park, Long Island, N. Y., September 5, 1920, by Mr. E. L. Bell. He also showed a male of this beetle, found by himself on Rockaway Beach, Long Island, September 17, 1916. He remarked that the species would probably soon be extinct on Long Island due to the death by fungus blight of the native chestnut trees of fruit-bearing age.

Scientific Programme.—Mr. Howard Notman first spoke of a curious "compound larva" observed by him last summer in the Adirondacks, N. Y.; it consisted of numerous *Sciara* larvae aggregated in a snake-like body. He then read some of his "Field and Breeding Notes on *Phytodecta*," which paper will be published in the BULLETIN. Dr. J. Bequaert then spoke on the "Bumble Bees in the vicinity of New York," comparing them with the bumble bee fauna of Southern Maine, Boston and Washington, D. C. The following species of Bombidae are at present known to occur near New York City: *Bombus affinis* Cresson, *B. americanorum* (Fabricius) (=*pennsylvanicus* of authors), *B. bimaculatus* Cresson, *B. fervidus* Fabricius, *B. impatiens* Cresson, *B. separatus* Cresson, *B. perplexus* Cresson, *B. terricola* Kirby, *B. vagans* F. Smith, *Psithyrus ashtoni* (Cresson), and *P. laboriosus* (Fabricius). With the exception of *B. terricola*, which has been taken on only a few occasions, all these species are common or very common. Lutz and Cockerell's "Check-List of the Higher Bees of North America," recently published, was also commented upon.

J. BEQUAERT,
Secretary.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

ARKANSAS INSECTS.—Will collect Lepidoptera and other orders. Correspondence solicited. Miss Louise Knobel, 417 West 2d Ave., Hope, Ark.

WANTED.—Small, bright colored butterflies. Will pay cash for them in quantities. We desire Lycaenas, small coppers and any other bright-colored small flies for use in butterfly jewelry work. The Cassino Studio, Salem, Mass.

WANTED.—Cynipidæ and their galls from all parts of the world. Exchange or cash. Western and Southern material particularly desired. Wm. Beutenmuller, Box 258, Highwood, Bergen Co., N. J.

WANTED.—Saldidæ, especially from the Western U. S. and Canada. Will name or give good exchange. J. R. de la Torre-Bueno, 11 North Broadway, White Plains, Westchester Co., N. Y.

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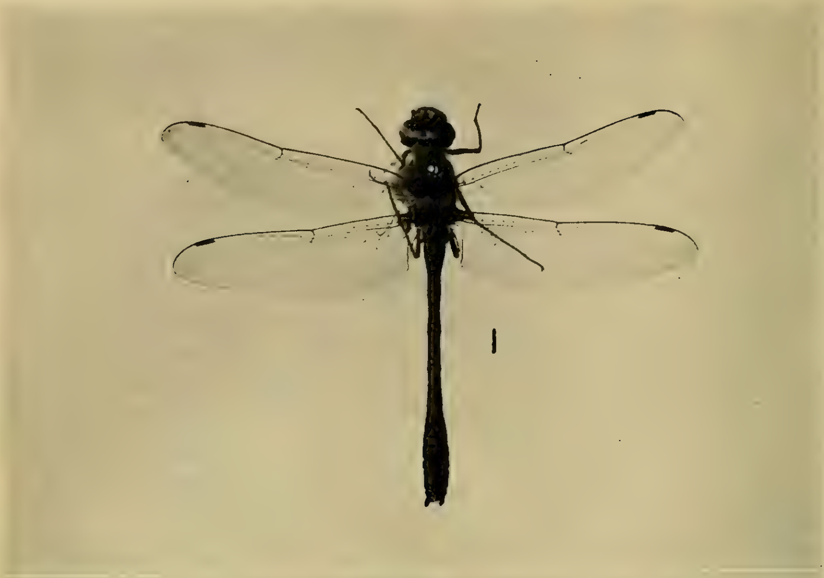

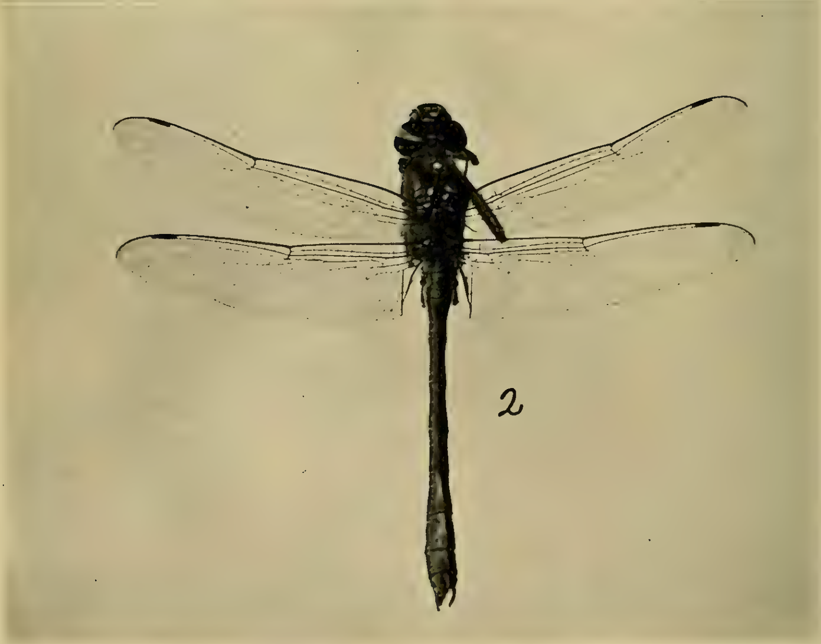

1. *Didymops transversa.*
2. *Didymops floridensis.*

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

VOL. XVI DECEMBER, 1921 No. 5.

A NEW DRAGONFLY FROM FLORIDA.

By WM. T. DAVIS, Staten Island, N. Y.

In 1839 Say described *Libellula transversa* from a male sent to him from Massachusetts by Dr. Harris. He gives the length of the insect as two inches, and also states "wings hyaline; basal cellula brown." In the complete writings of Say on the Entomology of North America, 1859, Uhler states that the species was "Subsequently described as *Epophthalmia cinnamomea* Burm. Handb. 2. 2. 845: and *Didymops servillei* Ramb., Neuropt. 142."

Burmeister's description of *cinnamomea* was made from a female collected in Carolina by Zimmermann, and covers what is now called *transversa;* he also mentions "fuscous basal spot on each wing."

Rambur states that his *Didymops servillii* is almost the size of *quadrimaculata* but a little longer, that the wings are hyaline with a small reddish spot in front at the base. Rambur proposed the genus *Didymops* for *servillii* (=*transversa*), which genus is separated from his genus *Macromia* by having the occiput on the dorsal surface of the head more prominent and much larger than the vertex. In *Genera Insectorum,* Martin (1914) lists *transversa* under *Macromia,* together with nine species placed in that genus by American authors.

In the writer's collection there are two male dragonflies belonging to a species that is close to *Didymops transversa* in structure and markings, but is larger and shows specific differences. One of them was submitted to Mr. E. B. Williamson, who has very kindly loaned me twenty-one specimens of *transversa* from his collection, which, with fourteen from my own, have constituted the material on which the following conclusions are based.

Didymops floridensis n. sp.

Type, male. Lakeland, Florida, March 28, 1912 (Davis). Davis collection.

Larger than *transversa*, and with a sharper front angle to the occiput. When the head is viewed in profile the post-clypeus is seen to be considerably sinuate at the extremity; in *transversa* there is no sinuation or only a feeble one. The abdominal appendages are about alike in both species, but in *floridensis* the close set hairs conspicuous on the terminal segments of the abdomen are very short, and about one half as long as in *transversa*. In the type and paratype of *floridensis* the lower part of the anal loop is straight and finally angled at the outer extremity, whereas in *transversa* the lower portion of the loop has generally an even curve.

In *transversa* the first antecubital space is clouded wholly or in part in both front and hind wings; in *floridensis* these spaces are clear. In *transversa* the costa, the median vein, and at least the basal part of the submedian vein are brown or brownish, while in *floridensis* the venation is black or nearly so except the costa which is pale. In *transversa* the frons is brown or dark brown; in *floridensis* it is almost entirely shining black. In *transversa* the occiput is greenish yellow and more broadly triangular than in *floridensis* where it is shining lemon yellow in color with the sides forming a more acute angle. The head is dull yellowish behind the eyes in *transversa;* in *floridensis* there is a long, narrow, shining black area chiefly above the tubercle, and extending to the occiput. The colors generally are more contrasting in *floridensis* than in *transversa;* the yellows are replaced by orange and the browns by black especially on the head. The abdomen widens out near the extremity in the same manner in both species; in both the appendages are nearly entirely pale in color, and except as indicated the spots and colors are also about the same in both.

MEASUREMENTS IN MILLIMETERS.

	Male Type.
Total length	65
Width of bead across eyes	10
Length of abdomen	46

Length of front wing	40
Length of front tibia	8
Length of hind femur	13

The measurements of the male paratype, collected at the same time and place, are almost exactly those of the type.

The large size, the narrow occiput, the shining black areas behind the eyes, and the clear antecubital areas of both pairs of wings of *floridensis* will readily separate it from *transversa.*

CICINDELA TRANQUEBARICA AND ITS HABITS.

By W. T. Davis, Staten Island, N. Y.

Cicindela tranquebarica was observed at Coram, Long Island, on the farm of Benjamin Still, situated in the sandy district about a mile north of the village, on September 19, 1920.

About four o'clock in the afternoon I selected a particular *Cicindela tranquebarica* on the sandy wood-road in the pines west of the house and commenced to watch it. It often ran about at considerable speed, would occasionally capture a small insect, and anon would remain quiet for a considerable time. Only once did it fly, at which time it changed its position about 20 feet to the west. Once it ran up to my shoe as I sat on the carpet of bear-berry vines by the side of the path. It started to dig a hole at the side of the path, but quit after working four minutes. Later it found a depression in the sand caused by the foot of a horse and commenced to dig a second hole at that part of the depression presenting a perpendicular face about one and one-half inches high. The beetle worked fifteen minutes, making a tunnel with its head in the hole and throwing out the sand with its legs. Then it turned about and backed into the hole, but did not close up the mouth of the tunnel; its head and mandibles were visible near the entrance. This was at 4.55 P.M. I secured a straw and gently poked the beetle, which would open its mandibles and fight back. I went away after teasing it a while and left it to its night's repose.

NORTH AMERICAN SARCOPHAGIDAE: A NEW GENUS AND SEVERAL NEW SPECIES FROM THE SOUTHWEST UNITED STATES.

By R. R. Parker, Bozeman, Mont.

(Contribution from the Entomological Laboratory of the Montana State College, Bozeman, Mont.)

Sabinata new genus.

Genotype: Sabinata catalina n. sp. Figures 1 to 5.
Vestiture of head black except for a few whitish hairs beneath foramen (seen only with difficulty); under sides of all femora with very long dense hairs (♂ only); ventral rows of bristles lacking on all femora (♂ only); at least middle and hind tibiae with double beards (♂ only); anterior tibia with two bristles on distal half of posterior face; scutellar bridge naked; anterior dorsocentrals and acrostichals present; four pairs posterior dorsocentrals; apical bristles absent; ventral plates large and extending posteriorly beyond edge of their respective nota; first genital segment with marginal bristles; accessory plates abnormally developed.

Besides the characters noted above, the greater ocellars are unusually strong, and the next to the uppermost pair of frontal bristles is bent forward (away from uppermost pair) in the males of the three known species. The second and third ventral plates are large and almost square; the third is more elongate. Some specimens have a single very slender hair-like bristle in the center of the posterior edge of the scutellum; others show possible vestiges of a pair of apical bristles.

Sabinata catalina n. sp.

Holotype (male): U. S. N. M.; *allotype* (female): U. S. N. M. *Length:* 8 to 13 mm.

Male.—Parafrontals, genae and transverse impressions silvery to lead gray; third antennal segment two to two and one-half times length of second; lateral verticals well developed; first and third veins with bristles; in larger specimens anterior tibia with posterior beard; in small specimens with at least some long beard-like hairs toward distal end; prescutellar acrostichals much weaker than other bristles of mesonotum; three pairs of scutellar marginals; posterior margin of fourth abdominal notum with two definite rows of bristles, the anterior row with the stronger bristles; genital segments of dull orange ground color with darker pollinose areas; vestiture of second segment the longer; first segment much broader than second, latter quite shallow and with its distal surface longer than its proximal portion, anal area extended back toward anterior edge of segment as a long, narrow band of membrane; forceps prong with greatly expanded base, distal portion bare, slender, in profile bent forward at right angle to base, then recurved, tip abruptly bent forward beak-like; from rear prongs beyond bases first divergent, then approximated leaving aperture; in profile distal part of forceps concealed by expanded portion of accessory plate; latter very large with smaller, hollow, proximal, stem-like, basal portion that opens on interior (opening not easily seen) and with greatly expanded distal portion that bears a prominent fringe of long, dull orange, coarse flexible " hairs."

Female.—Has essential non-secondary sexual characters of male. Third antennal segment unusually large and broad. First genital notum of normal form and of brownish color.

Described from 12 male and 3 female specimens.

RANGE.—**United States:** *Arizona*—S. Catalina Mts., Sabina Basin, Aug. 18, 24, 25, 26, 28 (allotype), Sept. 6, 8 (holotype), 14, 21 (11 ♂, 3 ♀), 4,000 ft. (C. H. T. Townsend). **Mexico,** Guanajuato (1 ♂), (A. Dugès).

Sabinata arizonica n. sp. Figures 6 to 9.

Holotype (male): U. S. N. M. Length: 10 to 11 mm.

Male.—Parafrontals, genae and transverse impressions silvery gray; third antennal segment at least twice length of second; gena with group (not row) of slender bristles above transverse impression near lower eye orbit; lateral verticals differentiated, but weak: only third vein with bristles; anterior tibia without even suggestion of a beard; prescutellar acrostichals fairly well developed; at least four pairs of scutellar marginals, three of them near apex; marginal bristles of fourth abdominal notum only appearing to be in two rows laterally; genital segment dull orange, first whitish or yellowish pollinose posteriorly, vestiture of first about length of that of second; latter much the smaller, anal area with tapering extension toward anterior margin of segment; forceps prong with greatly expanded base, in profile distal portion bent at right angle to base, tip expanded, seen from rear distal portion of each prong tapers to expanded tip and has

> some hairs on lateral edge, small aperture visible between prongs; accessory plate elongate, linear, and flat-tubular; posterior claspers as in *catalina;* penis specific, but very similar to that of *aldrichi.*

Described from 2 male specimens.

Range.—*Arizona* (holotype)—*New Mexico:* Hell Canyon, Sept. 19, 1916, 7,200 ft. (C. H. T. Townsend).

The copulatory organ of this species is practically the same as that of *S. aldrichi* n. sp. The latter is much the smaller species.

Sabinata aldrichi n. sp. Figures 10 to 14.

Holotype (male): U. S. N. M. Length: 8 to 9 mm.

The male of this species is very similar to that of *S. arizonica.* The penes are much alike, but *aldrichi* is a much smaller species. In *aldrichi* the slender bristles on lower part of gena near lower eye orbit are in a row, not grouped; there are three pairs of scutellar marginals instead of at least four; the upward extension of the anal area is less prominent; the forceps prongs are more slender and the fifth ventral plate is diagnostic (see figure 12).

Described from 3 male specimens.

Range.—*California*—Los Angeles County, July, 2 ♂ (holotype); Mt. Lowe, July 3, 1917, 1 ♂ (J. M. Aldrich).

List of Figures.

Fig. 1. *S. catalina* n. sp., posterior view of anal segments, showing anal area and greater width of first segment.

Fig. 2. *S. catalina* n. sp., profile view of genital segments: note shape of second segment.

Fig. 3. *S. catalina* n. sp., profile view of accessory plate and forceps prong.

Fig. 4. *S. catalina* n. sp., claspers.

Fig. 5. *S. catalina* n. sp., penis.

Fig. 6. *S. arizonica* n. sp., posterior view of anal area, forceps and accessory plates.

Fig. 7. *S. arizonica* n. sp., fifth ventral plate.

Fig. 8. *S. arizonica* n. sp., accessory plate, profile view.

Fig. 9. *S. arizonica* n. sp., anterior clasper.

Fig. 10. *S. aldrichi* n. sp., claspers.

Fig. 11. *S. aldrichi* n. sp., penis.

Fig. 12. *S. aldrichi* n. sp., fifth ventral plate.

FIG. 13. *S. aldrichi* n. sp., profile view of second genital segment.

FIG. 14. *S. aldrichi* n. sp., posterior view of end parts of forceps prongs.

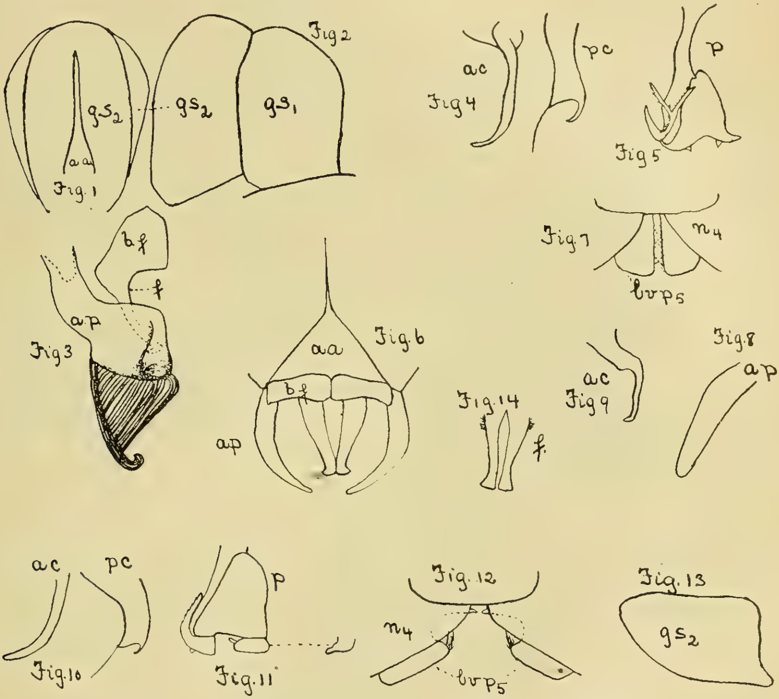
Fig. 1
gs2
aa
Fig 2
gs2
gs1
ac
Fig 4
pc
p
Fig 5
bf
f
ap
Fig 3
aa
Fig. 6
bf
ap
Fig. 7
n4
lvp5
Fig. 8
ap
ac
Fig 9
Fig. 14
f
ac
pc
Fig. 10
p
Fig. 11
Fig. 12
n4
lvp5
Fig. 13
gs2

ABBREVIATIONS ON PLATE.

aa.	anal area.
ac.	anterior clasper.
ap.	accessory plate.
f.	forceps.
bf.	base of forceps.
*gs*1.	first genital segment.
*gs*2.	second genital segment.
*lvp*5.	fifth ventral plate.
*n*4.	fourth notum.
p.	*penis.*
pc.	posterior clasper.

A SUMMARY OF THE FOOD HABITS OF NORTH AMERICAN HEMIPTERA.

By Harry B. Weiss, New Brunswick, N. J.

The Hemiptera, which are without exception sucking insects, exhibit some diversity in food habits, and it is the purpose of this paper to call attention to these in a very brief and general way. Compared with other orders of insects, the Hemiptera have never been favorite subjects for study, and detailed information about many species is lacking. In the table which follows the family food habits only have been indicated, and as a rule these have been based mainly on the activities of a comparatively few members. The figures referring to the number of species in each family were obtained from Van Duzee's "Catalogue of the Hemiptera of America North of Mexico." This catalogue does not include the *Aphididae, Coccidae* and *Aleurodidae,* and such families are not considered in the present paper.

Hemiptera.

Family.	No. species.	Habits.
Scutelleridae	26	Feed on vegetation, probably many are predaceous.
Cydnidae	45	In sand and mud banks; on vegetation.
Pentatomidae	164	Varied; predaceous; mostly plant feeders.
Coreidae	124	Plant feeders.
Aradidae	59	On fungi, under bark, fungivorous?
Neididae	8	Plant feeders.
Lygaeidae	187	Plant feeders; some may be predaceous.
Pyrrhocoridae	22	Plant feeders; some predaceous forms.
Tingididae	47	Plant feeders.
Enicocephalidae	2	Predaceous.
Phymatidae	12	Predaceous.
Reduviidae	113	Predaceous.

Hebridae	4	Found in wet places; predatory.
Mesoveliidae	1	Predatory.
Nabidae	21	Predaceous.
118—Cimicidae	4	On blood of birds, bats, man.
Anthocoridae	34	Mostly predatory.
Termatophylidae	1	?
Miridae	398	Plant feeders.
Isometopidae	4	Found in shaded situations.
Dipsocoridae	3	?
Schizopteridae	1	Found by sifting leaves, rubbish, etc.
Hydrometridae	2	Aquatic; predatory.
Gerridae	18	Aquatic; predatory.
Veliidae	15	Like those of *Gerridae*.
Saldidae	32	On shores of rivers, etc.; predaceous.
Notonectidae	18	Aquatic; predatory.
Naucoridae	13	Aquatic; predatory.
Nepidae	8	Aquatic; predatory.
Belostomidae	20	Aquatic; predatory.
Gelastocoridae	5	Predatory.
Ochteridae	3	Predatory.
Corixidae	55	Aquatic; vegetable feeders (predatory?).
Cicadidae	74	Plant feeders.
Cercopidae	25	Plant feeders.
Membracidae	185	Plant feeders.
Cicadellidae	698	Plant feeders.
Fulgoridae	357	Plant feeders.
Chermidae	137	Plant feeders.

The families and species in the above table can be roughly grouped, according to their food habits, about as follows:

	No. families.	No. species.	Per cent. of total.
Phytophagous	17	2,611	89
Harpactophagous	17	321	11
Animal parasites	1	4	..
Habits obscure	4	9	..
	39	2,945	100

On account of the large percentage which is phytophagous it is easily understood why the economic status of the order is important. With the inclusion of the *Aphididae, Coccidae* and *Aleurodidae,* this figure would be considerably higher. While most of these forms confine their activities to relatively unimportant plants, many are potential pests and some have attained prominence as serious enemies of agriculture.

Of saprophagous forms, the order is practically barren. The predatory species are fairly numerous, the percentage of these being about 11. These species appear to be important only in a limited way, and while their activities help to preserve a natural balance between certain groups, as a whole they lack elasticity, and do not, on account of their limited powers of reproduction, respond to any sudden increases in phytophagous forms. Beyond a certain point it is useless to expect more from them; on the other hand, the aquatic forms are a potential danger to fish hatcheries.

The four species listed as animal parasites consist of the well-known bed-bug and its relatives which frequent birds and bats. As a whole the food habits of the Hemiptera do not show as much variation as those of the Coleoptera. In this latter order about 26 per cent. of the species is phytophagous, 44 per cent. saprophagous and 27 per cent. harpactophagous. In other words, over 70 per cent. of the species of Coleoptera appear to be engaged in useful activities, while most of the Hemiptera are feeders upon the higher plants.

I am indebted to Mr. J. R. de la Torre-Bueno for information concerning the habits of the members of certain of the obscure families.

Our readers are invited to send in brief biological notes to fill small spaces like this.

A NEW SPECIES OF SAPRINUS FROM KANSAS (COLEOPTERA).

By A. B. Wolcott, Chicago, Ill.

The following described species is the largest of any yet described and although recognized as undescribed when first received, the writer delayed publication of the description in the hope that it might be made known from more abundant material.

Saprinus gigas sp. nov.

Broadly oval, strongly convex, black, highly polished, tarsi rufescent. *Head* nearly flat, coarsely, rather sparsely punctate, the occiput and sides more sparsely so; marginal striæ entire, united with transverse frontal stria. *Prothorax* a little less than twice as wide as long; sides strongly convergent, nearly straight in basal two-thirds; broadly rounded in apical third; marginal stria fine, distinct, not quite reaching the base; disk very minutely and sparsely punctate, abruptly becoming coarsely, rather densely punctate broadly, laterally and narrowly along basal margin except at middle. *Elytra* distinctly wider near base and one-half longer than the prothorax, distinctly wider than long; striæ as in *lugens,* except that they are impunctate, the dorsals more strongly arcuate and these with the sutural much longer, the latter very nearly attaining the base; the first dorsal with three uneven internal appendages, extending to the middle, the second and third equal, extending to apical third, the fourth slightly shorter, distinctly arched at base and obsoletely joining the sutural; punctures coarse, dense, longitudinally subcoalescent in apical three-fifths near the suture, in apical third at third dorsal, and latterly extending narrowly along the outer subhumeral to base. *Propygidium* short, five times as wide as long, coarsely rather sparsely punctate, feebly subcarinate in the middle; *pygidium* feebly convex, strongly carinate in the middle, coarsely sparsely punctate, becoming gradually finer and denser toward the apex. *Prosternum* moderately convex; striæ nearly as in *lugens* but with the apical portion much longer and more strongly ascending, subapical foveæ wanting. *Anterior tibiæ* with eight or nine erect, subacute teeth becoming much longer and stronger toward the apex. Length 9.25 mm.; width 6.00 mm.

Salina, Kansas, collected by Mr. Warren Knaus, by whom it was kindly given to me.

Allied to *S. lugens* Erichson, but differing from that in many details of structure aside from its much greater size. The principal distinguishing characters are the longer elytral striæ, the less extensive punctate area of elytra, the much more polished surface and strongly carinate pygidium. The pronotum is very deeply impressed each side near apical angles.

A RECLASSIFICATION OF THE SUBFAMILIES AND GENERA OF THE NORTH AMERICAN SYRPHIDAE.

By Raymond C. Shannon, Bureau of Entomology.

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(Continued from p. 72.)

The Syrphinae are the most important group, economically, of the *Syrphidae;* also the one most in need of thorough revision. In the course of a revision of this group the first splitting of the genera may have to be made on the character of the beading of the lateral margins of the abdomen. The genus *Chrysotoxum* illustrates this character best. However, it will be only by a careful consideration of the species that better definitions for the genera will be arrived at.

Table of Tribes and Genera of Syrphinæ.

1. Face and scutellum entirely æneous or black; lateral margin of abdomen never beaded; costa ending at or slightly beyond tip of wing .... Tribe *Melanostomini* 2.[1]
Face, or scutellum, usually both, at least in part yellow;[2] lateral margins of abdomen more or less beaded (except in *Baccha, Paragus, Allograpta* and about one half the species of *Syrphus*); costa frequently ending before tip of wing, more rarely at or beyond .... 4.

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[1] Contains feebly characterized genera.

[2] Certain species of *Syrphus, S. macularis* for example, may be confused with *Melanostomini* because of blackish face and scutellum.

2. Wings shorter than abdomen; abdomen depressed, long-elliptical; front and middle tarsi elaborately developed. *Pyrophæna.*[3]
Wings longer than abdomen .... 3.

3. Front tibiæ slender in both sexes .... *Melanostoma.*
Front tibiæ and tarsi of male dilated; those of female slightly widened .... *Platychirus.*

4. Long pilose species; face protruding; scutellum yellow; squamæ blackish; basal half of abdomen partly yellow and greenish æneous, clothed with yellow pile; posterior half shining black and with black pile ...... *Leucozona.*
Body clothed with short pile .... 5.

5. Face less than one third the width of head; mesonotum and abdomen rarely with yellow markings .... 6.
Face usually wider than one third the width of head; abdomen and frequently thorax with bright yellow markings .... Tribe *Syrphini* 7.

6. Elongate, usually very slender, species; eyes bare; costa ending at, or slightly beyond, tip of wing. (*Bacchini* = *Ocyptamus, Baccha, Salpingogaster*) .... *Baccha.*
Small, robust species with pilose eyes; costa ending before tip of wing .... *Paragus.*

7. Sixth abdominal segment (hypopygium) of male as long as the two preceding ones together, cylindrical; fifth segment of female one half as long as preceding. *Eupeodes.*
Hypopygium of male not protruding; fifth segment of female one third, or one fourth as long as preceding ... 8.

8. Head very large, frons inflated, surface of wings with scarcely a trace of villi except in subcostal cell. (*Catabomba*) .... *Scæva.*
Head normal; wings clothed with villi .... 9.

9. Antennæ very elongate, about six times as long as broad. *Chrysotoxum.*
Antennæ less than three times as long as broad .... 10.

10. Third longitudinal vein deeply constricted into discal cell. *Didea.*

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[3] *Melanostoma kelloggi* has *Pyrophæna* type abdomen but has simple tarsi.

Third longitudinal vein straight or with a gentle downward curve . . . . 11.

11. Lateral margins of mesonotum not marked with bright yellow . . . . *Syrphus.*[4]
Lateral margins of mesonotum more or less bright yellow . . . . 12.

12. Posterior margin of mouth and the metapleura blackish æneous . . . . 13.
Region behind mouth bright yellow; metapleura usually bright yellow . . . . 14.

13. Hind femora of male thickened and arcuate, tibiæ arcuate and dilated at tip; hind femora of female posteriorly with blackened ring . . . . *Toxomerus.*
Hind femora and tibiæ of male normal, hind tibiæ of female entirely yellow, rarely (var. *boscii*) with blackened ring posteriorly . . . . *Mesogramma.*

14. Anterior margin of wings brownish; abdomen narrow, cylindrical . . . . *Doros.*
Anterior margin of wings hyaline . . . . 15.

15. Eyes of male above with an area of enlarged facets; fourth segment of abdomen, in both sexes, with two median yellow stripes and oblique side-spots . . . . *Allograpta.*
Eyes of male normal; fourth abdominal segment not so marked . . . . 16.

16. Face projecting below; slender species . . . . . *Sphærophoria.*
Face receding; abdomen broadly oval . . . . . *Xanthogramma.*

NAUSIGASTERINÆ, new subfamily.

In many respects this is the most aberrant subfamily (only one genus) of the Syrphidæ found in North America. It offers the following unique characters which at the same time show a remarkable instance of parallel development with a group belonging to the Hymenoptera, the Chrysididæ.

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[4] *Syrphus ribesi* is here considered as possessing the "type structure" for Syrphinæ.

As in Chrysididæ, the abdomen of *Nausigaster* is composed of four visible segments (sometimes three in Chrysididæ). It is rimmed with a projecting edge and can be doubled under and against the thorax, enclosing the ventral aspect of the latter; all of the chitinous parts of the body are thickly punctured and have a metallic reflection; a scale-like projection of the thorax is present near the base of the wing.

The wing venation is fairly similar to that of the Chilosinæ except for the almost complete absence of the anal furrow.

MICRODONTINÆ.

Table of Genera of Microdontinæ.

1. Third vein with an adventitious branch extending downward into the discal cell .... 2.
Third vein simple; abdomen spatulate .... *Mixogaster.*

2. Abdomen spatulate, face swollen and prominent below. *Rhopalosyrphus.*
Abdomen ovate or with parallel sides; face gently arched; tarsi short and crassated .... *Microdon.*

CHILOSINÆ, new subfamily.

This subfamily merges into the Xylotinæ, through *Myiolepta, Brachyopa,* et al., so gradually that it is with some difficulty separated therefrom. However, for practical purposes, the old character of the position of the discal crossvein works very satisfactorily. These subfamilies are the last to appear in the table of subfamilies and by having the other groups excluded, the matter of separating these two is fairly simple.

Several species of *Cynorrhina* (Xylotinæ), *C. pictipes* and *nigra,* because of the position of the discal crossvein, are treated in the table of Chilosinæ. On the other hand the genus *Ferdinandea,* apparently very closely related to *Chilosia,* appears in the table of Xylotinæ, because the discal crossvein joins the discal cell at, or beyond, the middle.

Table of Genera of Chilosinæ.

1. Alula greatly reduced, being narrower than the second basal cell; anal furrow very short or absent; abdomen either

constricted basally, or the third antennal joint greatly enlarged; males dichoptic. (*Sphegini* and *Pelecocerini*) 14.
Alula broader than second basal cell; anal furrow distinct and of normal length; males holoptic except in *Chalcomyia* .... 2.

2. Face entirely black (*Chilosini*, in general) .... 3.
Face more or less yellow (gray in *Brachyopa vacua*). (*Brachyopini*, in general) .... 9.

3. Oral opening broadly oval and without indentations; face very gently and evenly convexed, completely clothed with rather long, loose pile .... *Pipiza*.
Oral opening irregular in outline, having a dorsally directed indentation at the front margin .... 4.

4. Antennæ very elongate, with a terminal style .... *Callicera*.
Antennæ of normal length and with dorsal arista ...... 5.

5. Face flat[5] with the epistoma protruding anteriorly ...... 6.
Face either tuberculate (*Chilosia* type) or concave (*Xylota* type) .... 7.

6. Abdomen inflated, the disc shining; face and frons without transverse wrinkles; rather pilose species ...... *Psilota*.
Abdomen depressed, the disc flat and dull; face and frons usually with transverse wrinkles; pile very short and scant .... *Chrysogaster*.

7. Fourth vein joining the third much before the wing margin; a chitinous projection extending from the face upwards between the antennæ to join a similar downward projection of the frons; face tuberculate in both sexes; arista frequently more or less plumose. Many species bearing bristles on thorax .... *Chilosia*.

Fourth vein joining third at a very acute angle close to wing margin; space between antennæ pale and membranous; arista bare; no bristles on thorax .... 8.

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[5] Certain males of *Chrysogaster* have a very small central knob but these can easily be placed generically by the flat, dull disc of the abdomen.

8. Scutellum unusually large, nearly quadrate; males dichoptic; face concave .... *Chalcomyia.*
   Scutellum normal; males holoptic; face concave in the females, tuberculate in males .... *Myiolepta.*

9. Body clothed with scattered, yellowish-white, scale-like appressed pile; face with a broad yellow stripe on each side .... *Eumyiolepta*, new genus.
   Pile of normal structure .... 10.

10. Epistoma produced into a long porrect snout; costal vein continued well beyond apex of wing; the usual hairs on the base of the costa reduced to minute spines .. *Rhingia.*
    Epistoma not produced snout-like, etc. .... 11.

11. Thorax bearing distinct bristles; arista plumose .... 12.
    Thorax not bearing differentiated bristles; arista bare .. 13.

12. Color largely black, face and sometimes humeri and scutellum more or less yellow; general shape of head broadly oval. (Females of several species of *Chilosia.*)
    Color ferruginous; head triangular .... *Hammerschmidtia.*

13. Antennæ placed below middle of head; costa ending at or slightly beyond tip of wing .... *Brachyopa.*
    Antennæ placed above middle of head; costa ends before reaching tip of wing .. (*Cynorrhina pictipes* and *nigra.*)

14. Third antennal joint greatly enlarged. (*Pelecocerini*) .. 16.
    Third antennal joint of normal size. (*Spheginini*) .... 15.

15. Arista shorter than antennæ; epistoma produced downwards, in profile gently concave .... *Neoascia.*
    Arista longer than antennæ; epistoma produced anteriorly, face in profile deeply concave .... *Sphegina.*

16. Antenna with dorsal arista .... *Chameosyrphus.*
    Antenna with terminal style .... *Pelecocera.*

SERICOMYINÆ, new subfamily.

The Sericomyinæ, at first glance, form a rather heterogeneous group. However the long plumose arista and the unequal development of the posterior claspers of the genitalia indicate a mutual relationship. Due to the heterogeneous characters of this group it is not sharply definable on external characters. It is necessary to use the characters given in the table in order to retain *Arctophila flagrans* in the genus; should the loop in the third vein be considered of prime importance this species would have to be placed in the Eristalinæ and a new genus would have to be erected. Obviously this would be an error.

Table of Genera of Sericomyinæ.

1. Short pilose species; abdomen with bright yellow markings . . . . 2.
Long pilose species; no yellow ground markings on abdomen . . . . 3.

2. Post alar callus and margin of scutellum with rather short, stout bristles; third vein with a deep loop into discal cell. *Condidea.*
Thorax without bristles; third vein at most with only a gentle downward curve . . . . *Sericomyia.*

3. Thorax and abdomen with more or less yellow pile; face not unusually broad or swollen . . . . *Arctophila.*
Pile entirely brownish; face unusually broad and swollen. *Pyritis.*

VOLUCELLINÆ.

Another character of the Volucellinæ which may be well to note is the condition of the anterior corners of the abdomen due to the unusual broadness of the squamæ. The squamæ extend posteriorly as far as the second tergite. Below the squamæ the first tergite is greatly depressed, sometimes forming a trench-like groove, and at the same time this area is either bare or possesses pile much shorter than on the posterior corners of the second tergite. This character is also present in several genera of the Eristalinæ and may be seen to good advantage in *Mallota* and *Meromacrus.* It may be of value to further divide genera and species in these subfamilies.

Table of Genera of Volucellinæ.

1. Arista very densely plumose, appearing as a solid mass, the arista itself thickened . . . . *Copestylum.*
Arista loosely plumose . . . . 2.

2. Hairs of arista retrosse; males dichoptic (Tropical; included in Williston's Manual) .... *Megametopon.*
Hairs of arista not retrosse; males holoptic ...... *Volucella.*

ERISTALINÆ.

The characters given in the table of subfamilies sharply separate the Eristalinæ from the Xylotinæ; two groups which formerly were not considered separable because of such genera as *Tropidia, Syritta, Pterallastes* and *Teuchocnemis* which were thought to be intermediate. The long pile on the face and frons is characteristic of the Eristalinæ, while typical genera of the Xylotinæ have the face bare, except for some scattered hairs along the eye margins. Further, in the males of Xylotinæ the frons is bare while the females have a broad bare space above the antennæ.

The genera included in this subfamily are easily distinguished except in the *Helophilini.* However even in this tribe there are several good characters that can be used to divide them into several groups and an attempt has been made here to split the group. This arrangement is by no means final.

Polydontomyia (=*Triodonta*) has been considered congeneric with *Pterallastes* (Xylotinæ). The distribution of the pile on the head and the dichoptic male easily locates it in the *Helophilini.*

A discussion of the squamæ and the first tergite is given in the remarks under Volucellinæ.

Table of Genera of Eristalinæ.

1. Marginal cell closed .... 2.
Marginal cell open .... 3.

2. The bright yellow markings on the occiput, thorax and abdomen formed by tomentum; all the femora spinose beneath; face rather evenly hollowed, somewhat of the *Xylota* type .... *Meromacrus.*
Pile thin and normal in structure; fore femora, at least, without spines; face hollowed beneath antennæ then raised to a prominence .... *Eristalis.*

3. Densely pilose species of bumble-bee appearance .... 4.
Thinly pilose, not bumble-bee-like; males dichoptic (*Helophilini*) .... 5.

4. Face in profile evenly hollowed; arista shorter than antennæ; upper edge of third antennal joint with groove-like impressions, apparently formed to receive the arista. *Merodon.*

Head of *Eristalis* type; arista distinctly longer than antennæ, third antennal joint without groove-like impression. *Mallota.*

5. No stigmatical crossvein; epaulet at base of costa broad and clothed with mostly yellowish hairs; squamæ broad, bordered by dense, straight cilia; abdomen broad with yellow markings. (*H. similis* group: *H. similis, latifrons, dychei, borealis, pendula* of Eu.; and probably *glacialis* and *groenlandicus*) .... *Helophilus.*

Stigmatical crossvein present .... 6.

6. Large robust species, about 17 mm.; hind tibiæ of both sexes arcuate; sides of second tergite of female folding downwards, covering the membranous tissue at sides of second sternite; abdomen of male narrowing posteriorly (*P. curvipes*) .... *Polydontomyia.*

Smaller species, either 11 mm. or less and broad, or 12–14 mm. and slender; hind tibiæ straight or gently arcuate ... 7.

7. Ocelli widely separated in both sexes; mesonotum with very indistinct stripes; pleuræ and all femora shining black; squamal cilia unbranched; broad species. (*A. mexicanus* and *willingii*) .... *Asemosyrphus.*

Ocelli not unusually far apart .... 8.

8. Slender species; squamal cilia branched. (*H. chrysostomus* and *distinctus*) .... *Helophilus.*

The remainder: *hamatus, conostoma, porcus, modestus, integer, lætus, bilinearis, lunulatus,* etc., are of several types more easily recognized by habitus than otherwise.

(Continued in February number.)

Wanted—Brief notes to fill such spaces as these.—Ed.

NOTES ON PARASITES OF EPARGYREUS TITYRUS FABRICIUS.

By E. L. Bell, Flushing, N. Y.

A considerable number of larvæ of *Epargyreus tityrus* Fabricius were collected at Flushing, N. Y., during the latter part of September, 1920, in an endeavor to obtain some of the parasites of this species of butterfly. One of the larvæ died and dropped from its nest of leaves of the locust tree and in its place there were a number of small, fuzzy, white cocoons. These cocoons were placed in a cloth covered jelly glass with a little sand in the bottom and a few small sticks placed upright for the insects to crawl on upon emergence, and kept in a warm room. About once in two weeks a little water was poured on the cloth covering the top of the glass which, of course, went through and slightly moistened the sand in the bottom.

The adults began to emerge from the cocoons on December 22, thirteen emerging that day, twelve on December 23, two on December 24, two on December 25, one on December 26, two on December 27, four on December 28, two on December 29, and one on January 2, a total of thirty-nine. They did not seem to care to crawl up on the sticks placed in the glass for that purpose, but seemed to prefer to crawl up on the side of the glass just above the sand or to remain on the sand itself. They made no attempt to fly when disturbed but merely dropped off the side of the glass or ran down to the sand. Several more clusters of these cocoons of the parasite were found within the cocoons spun by the *tityrus* larvæ in the sphagnum moss at the bottom of the breeding cage, the larvæ having been destroyed after spinning the cocoons, but before pupation. These parasites proved to be *Apanteles argynnidis,* described by C. V. Riley in Scudder's *Butterflies of New England,* 1889, Volume 3, page 1904, bred from *Argynnis cybele* Fabricius, by W. H. Edwards.

NOTE ON CICINDELA TASCOSAENSIS.

By Wm. T. Davis, Staten Island, N. Y.

This tiger-beetle was described in the Bulletin of the Brooklyn Entomological Society for April, 1918. In 1920 a specimen was sent to Dr. Walter Horn, of Berlin, Germany, and under date of November 21, 1920, he wrote as follows: "Many thanks for your favor of October 30, and the fine specimen of your *C. tascosaensis* and its description. I was quite astonished to see that it is really the same as my *C. roseiventris* subspecies *linearis*. That is a *very* strange case of geographical distribution! Texas and Costa Rica! Hardly to be understood, but about the exact locality of my subspecies *linearis* there is no doubt at all, and I have full confidence that your locality is also quite exact."

Upon receipt of the above a letter of inquiry, in which the information received from Dr. Horn was mentioned, was addressed to Miss Mildred McGill, of Tascosa, Oldham Co., northern Texas. She replied under date of December 21, 1920, that she remembered well collecting the tiger-beetles. Her letter continues as follows: "It does seem strange that they would be found in localities as far apart, and this part of the country is so far from the coast, though the altitude may be similar. The elevation here is 3,177 feet. You can see from the house the place where I captured the tiger-beetles. It is about a mile or a little more. . . . I chased them around on the sandy, grassy spots of the ground, and on the wide floors of white sand rocks. This year I thought sure I would capture some *tascosaensis* again, but at the time they should have been flying I was so very busy with Post Office work I could not get out and look for them."

ECOLOGICAL NOTES ON CYMATIA AMERICANA (CORIXIDAE, HEMIPTERA).

By Roland F. Hussey, Forest Hills, Mass.

(Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 189, and from the Entomological Laboratories of the University of Minnesota.)

I. A Remarkable Mode of Hibernation.

The hibernation of the waterbugs is a peculiarly interesting subject, and one about which comparatively little is known as yet. Certain species, notably the surface-dwelling forms, pass the winter under logs, mats of grass, and other debris at the margins of the ponds and streams on which they are found during the summer. It seems that they must certainly endure temperatures far below the freezing point, especially in the more northern parts of their ranges. The truly aquatic forms, living in the open water, are commonly reported to hibernate deep in the mud at the bottom of the ponds; and here the temperature probably never goes below the freezing point in normal winters.

To these two types of hibernation may be added a third, to be described below, which is truly unique: here the bugs pass the winter sealed in small cavities in the ice which covers the ponds in which they dwell in summer. This peculiar mode of wintering was observed at a small pond at the northeast corner of the University Golf Links, a little over half a mile north of the University of Minnesota Farm School in St. Paul. This pond is roughly trapezoidal, about 75 yards long and 40 yards wide at its widest point. A roadway has been built through the pond, cutting off a small part near the south end. The bottom is very soft mud, and, especially in the larger part, the pond has only a very scant growth of aquatic vegetation.

Collections made here in September and October of 1918 showed the hemipterous fauna of these ponds to be fairly typical of the north-central United States. Various species of Corixidæ were found to be the most numerous of the waterbugs, and most abundant of these was *Cymatia americana* Hussey. In connection with the description (Bull. Brookl. Ent. Soc., xv, p. 82, 1920) of this species, I noted that it had been found hibernating in a very peculiar situation, and stated that further investigation of this habit was planned. However, owing to the great scarcity of material during the following winter, I was unable to carry my studies further; and as I am no longer located in a region where this species occurs, it seems advisable to publish the data which I have.

On January 15, 1919, I went to these ponds for the purpose of obtaining specimens of *Buenoa margaritacea* Bueno for experimental work in the laboratory. At this time about ten days of very mild winter weather had followed four or five days of zero temperatures, and the ice on the ponds was only about eight inches thick. I had chopped down to a depth of about six inches over an area about a foot square before the axe broke through and the hole filled with water. At the next stroke of the axe some twenty or thirty Corixids, of the species referred to above, appeared and floated up to the surface, where they remained motionless. I collected these, and soon had obtained seventy or eighty more in the same manner, all *apparently* coming from below the ice. Then a block of ice about six inches square and two or three inches thick was broken off, and I discovered the source from which I was obtaining at least a part of the specimens.

In the ice itself, from half an inch to an inch above the water, there were several small pockets, the largest of which was less than an inch and a half in diameter, and in these the Corixids were tightly crowded in groups of from ten to fifty individuals. Some of the pockets had small open passages leading into them, which may possibly have communicated with the water or with other pockets; but others were entirely sealed in by the ice. In some cases which I found later there was a space of two or three millimeters between the mass of bugs and the wall of the chamber. No bugs were found singly and only the one species was found hibernating in this manner. In all, I collected nearly three hundred specimens from an area of little more than a square foot. The water here was about fifteen inches deep below the ice.

When the specimens were taken into the laboratory and placed in warm water, they all revived. The bugs which were placed in water at a temperature of 14° C. first began to show movement after twenty minutes, while others placed in water at 20° required only about half that time. The first movements observed were spasmodic twitchings of the hind legs; after about five minutes more the bugs began to pass their legs over the hemelytra, thus covering them with a film of water, and attempted to dive. Flashing a strong light directly above the dishes containing the bugs provoked strong reactions which persisted for perhaps half a minute if the light remained on, but which died away almost immediately if the light were merely flashed. At this time only a few individuals were able to break down through the surface film, the others being able merely to swim about in an erratic manner over the top of the water. In all nearly forty minutes had passed before any of the bugs were able to grasp pebbles or plants in the shallow aquarium and so to remain submerged, and only after an hour were they able to swim downward in a normal manner.

About one fifth of the boatmen died within twenty-four hours after they had been revived in this manner; this may have been due largely to shock from the sudden change of temperature. A considerable number of individuals were still alive, however, when I left Minneapolis some six weeks later.

Experiments were begun at once to discover the manner in which the Corixids get into the pockets in the ice, but they had hardly been started when I was forced to abandon them for a time.

When I returned to Minneapolis in the fall of 1919, I made several trips to this pond and to the other ponds in the vicinity, but it was not until November 17 that I obtained any individuals of this species, though several species of *Arctocorisa* were plentiful. On this date the pond was covered by about two inches of ice, and the single female *Cymatia* seen was swimming rather sluggishly in the open water near the bottom, where the water was about fifteen inches deep. A week later a single male was taken in the same place, and during December a few other individuals were also secured here. Meanwhile the other Corixids

(*Arctocorisa* sp.) became less numerous, and finally, on January 9, none were seen; on this last date five specimens of *Cymatia* were taken from under the ice, which was now about twenty inches thick, and which showed no trace of the air-pockets in which the bugs had been found the previous winter.

These last five individuals were all torpid. They were taken back to the laboratory in ice-water, and gradually warmed to room-temperature, but none of them survived. The only movements made by any of them were spasmodic twitches of the legs and were induced by flashing a strong light over them.

At present we can give no answer to the many interesting problems which are suggested by these observations, such as the manner of formation of the air-pockets, the entrance of the bugs into them, the occurrence of but the one species of Corixids in the pockets, the fact that no individuals of *Cymatia* were found singly and frozen tightly in the ice, whether this mode of hibernation is merely accidental in *Cymatia,* or is characteristic of the species. All of these are problems which merit investigation, and I regret that I have been unable to continue my studies of them.

II. NOTES ON THE FOOD HABITS OF *Cymatia americana.*

Until recently it has been very generally stated by writers on the aquatic Hemiptera that the Corixidae are carnivorous insects. But Hungerford (Science, N. S., xlv: 336–337, 1917; Jl. N. Y. Ent. Soc., xxv: 1–5, 1917; Kans. Univ. Sci. Bull., xi: 234–249, 1920) has shown that various species of *Arctocorisa, Palmacorixa* and *Rhamphocorixa* commonly feed upon organic ooze which develops on the debris in the pools which they frequent, and that they are primarily herbivorous insects. And the structural adaptations of the head and of the fore-legs are indeed admirable for their mode of feeding.

The structure of the head and of the mouth-parts of *Cymatia* is essentially the same in *Cymatia* as in the other genera of the family; but the adaptations of the long cylindrical tarsi (palae), with their rows of long bristles (for figures of the palae of *Cymatia,* see BULL. BROOKL. ENT. SOC., vol. 15, pl. 1, 1920), for this type of feeding is much less obvious than in the case of Arctocorisa, etc., where the palae are shorter and broader, and flat or even concave on the side which is applied to the face in feeding. In fact, the structure of the palae in *Cymatia* is such as to suggest carnivorous habits, the palar bristles as well as the long movable terminal claw indicating their use in the retention of prey.

That these structures are employed in this manner has been observed directly. For about ten weeks during the winter of 1920–21 I kept a pair of *Cymatias* in a small balanced aquarium on my table. On November 24 several larvae of a *Corethra* were placed in this aquarium also, and a few days later one of the Corixids was seen to be feeding on a *Corethra,* holding it tightly pressed to its face by means of its front legs; but the *Corethra* was released before I could make any close observations.

On December 19 the stock of *Corethras* had become exhausted, and more were added to the aquarium. Almost at once one of the *Cymatias,* which was at rest on the bottom, struck at one of the larvae, but missed; it then floated up toward the surface, directly under another of the larvae. When about one centimeter below the *Corethra,* the bug gave a quick stroke upward, turned on its side, seized the larva, and swam down to the bottom, where it proceeded to feed on its prey. The *Cymatia* held the *Corethra* closely pressed against its face by means of its front legs, the palar bristles of which crossed each other forming a sort of net which helped to hold the prey, while the palar claws were bent nearly at a right angle with the pala and closely pressed against the larva. The mandibular and maxillary stylets of the *Cymatia* were protruded considerably from the oral aperture, and were worked rapidly back and forth in the body of the larva. After twenty minutes the *Corethra* ceased to move; though at first its struggles were so strong as to dislodge the Corixid's hold on the bottom, they were not sufficient for it to escape. During the feeding process the Corixid manipulated the *Corethra* somewhat, sometimes holding it straight and at other times in the form of a U. After sixty minutes the bug came to the surface for the first time after it began feeding, and ten minutes later the *Corethra* was dropped, now shrunken to about two-thirds of its normal length.

While these observations were being made the other *Cymatia* also captured and fed upon a *Corethra* larva. The details of feeding were essentially the same in this case as in the other. During the time when they were under my observations, about ten weeks in all, the two Corixids continued to feed upon the *Corethras,* each one taking about one each day, on an average. I also observed them strike at Entomostracans several times, but I can not say whether these were eaten or not.

There is nothing in these observations, of course, which proves that *Cymatia americana* is not herbivorous as well as carnivorous; and Hungerford has stated that even the forms which are primarily herbivores will, under extreme conditions, attack *Chironomus* larvae and small worms, and it may well be that this is such a case. Further observations on the food habits of *Cymatia,* especially in summer, are necessary to decide this point. However, in view of the predaceous adaptations of the palae, I am inclined to believe that *Cymatia* is primarily predatory. It may be worth mentioning that the pond from which all my Minnesota specimens of *Cymatia americana* were taken has a large *Corethra* population.

These studies of *Cymatia* were undertaken at the Entomological Laboratory of the University of Minnesota, under the direction of Professor Royal N. Chapman, to whom I wish to express my appreciation for his active interest in them, as well as for his valued assistance in the field work during the winter of 1919–1920.

Food Plant of Cymus discors Horv.—This bug was found in White Plains, N. Y., on the sedge *Scirpus polyphyllus* Vahl. on September 10. The insect breeds in the seed heads, now ripe and fuzzy, and was found concealed in them, from the 2d or 3d instar to the freshly transformed adult, two or three in each cluster of seeds. Each head harbored from twenty up.

J. R. de la Torre-Bueno.

BOOK NOTES.

The Nature of Animal Light, by E. Newton Harvey, Ph.D. (*Monographs on Experimental Biology*, J. B. Lippincott Co., Philadelphia, $2.50). This monograph, while not primarily devoted to insects, except as they produce light, has considerable of interest to entomologists, particularly coleopterists. Everyone, of course, is familiar with our common fireflies but not all entomologists know what causes them to glow. Nor are insects the only living beings that exhibit light-phenomena. They range from bacteria up the scale of life through various fungi; and from protozoa through fishes.

Fireflies have a substance which gives off fluorescent light. But in general the light-giving substances in animals are dependent on oxygen to produce light. *Pyrophorus* was studied as early as 1864 by the great Pasteur. The third chapter of this work relates to the physical nature of animal light, many of the animals referred to being insects, principally lampyrid beetles. In fact, as the most easily available material is insects, every chapter in this highly interesting, though technical, work refers to them. Every student of the Lampyridæ should read it.

Keys to the Orders of Insects, by Frank Balfour Brown, Lecturer in Entomology in the Univ. of Cambridge (Macmillan, N. Y, $1.50). These keys are primarily for students in courses in entomology at Cambridge University. They apply only to six orders, those most commonly met with—namely, Orthoptera, Hemiptera, Lepidoptera, Coleoptera, Diptera, Hymenoptera, the Linnean orders, lacking the Odonata. The keys are in the main founded on previous work and of course are much simplified. There are four plates of structures of Lepidoptera, Diptera, and Hymenoptera with the parts named. It is not, nor does it purport to be, a new and philosophic scheme of classification. Melander and Brues' keys are more extensive and more in the line of a classification of the whole class; these discussed are working keys for the purpose of quickly placing specimens where they belong. For this purpose they are excellent and should be a great help to science teachers. To the specialist they offer nothing not known heretofore, although they are a part of the literature of entomology.

J. R. T. B.

PROCEEDINGS OF THE SOCIETY.

Meeting of January 13, 1921.—The same officers of the Society were reëlected to serve during the year 1921.

Scientific Programme.—Mr. Jacob Doll communicated "Notes on Some Interesting Lepidoptera." Referring to Mr. Engelhardt's remarks at the preceding meeting on *Utetheisa bella,* he exhibited a large series of color variations of this species selected from some 30,000 to 50,000 specimens which have passed through his hands in the last 50 years. The caterpillar of this moth lives on the rattle box (*Crotalaria*). From his breeding experience, Mr. Doll found that one year a lot of larvae that had been starved gave a great variety of color forms, while adults from another lot that had been well fed, were almost all alike. The wide range of variation is exhibited by only the females in this species, while the males are all very similar. Mr. J. R. de la Torre Bueno read a paper on the "Saldidae of New York State." Mr. Howard Notman exhibited a series of the moth *Eufidonia notataria* Walker from Keene Valley, Adirondacks, N. Y., including many color variations.

Meeting of February 10, 1921.—*Scientific Programme.*—"Exhibition and Discussion of Interesting Insects." Mr. Howard Notman showed *Cinclidia harrisi* Scudder collected by him in a little meadow at the top of a hill at Keene Valley, Adirondacks, N. Y., one of the specimens representing quite a distinct color form. Mr. Wm. T. Davis mentioned having taken the same moth at Hewett, N. J., June 19, and at Potter Swamp, Yates Co., N. Y., June 14, 1915. Mr. Chas. Schaeffer spoke of a specimen of *Trogus fulvipes* Cresson received from Mr. Doll, who obtained it from a pupa of *Papilio turnus.* Since there are no structural differences between *T. fulvipes* and the common *T. vulpinus* (Gravenhorst), there is a question whether the former is specifically distinct. Dr. J. Bequaert gave a brief account of his collecting experiences with Mr. Notman in the Adirondacks last summer. Mr. Davis exhibited several interesting Diptera: *Hermetia illucens* (Linnaeus), taken at Arlington, Staten Island, N. Y.; *Mydas clavatus* Drury, also from Staten Island, usually found flying around old tree stumps, he stated; one of the specimens of *Mydas,* when captured, struck him on the finger, the bite being very painful for the moment; and *Microstylum morosum* Loew, from Tascosa, Texas, the largest robber fly of the United States. Mr. C. A. Weeks delivered a lecture on the "Comparative Economic Importance of Insects and Birds."

Meeting of March 10, 1921.—*Scientific Programme.*—Messrs. W. T. Davis, G. P. Engelhardt and J. Bequaert gave accounts of the "Insects collected at the Penniquid Barrens, Long Island," during the summer of 1920. Mr. Davis stated that the Penniquid Barrens are shown on the Map of the Soils of Long Island, published by the U. S. Dept. of Agriculture in 1903, as Norfolk Sand, which consists chiefly of medium to fine grades of quartz sand stained to an orange or yellow color. The Norfolk Sand on Long Island is said to have been deposited as a coarse water-borne sediment, an outwash of the glacier. On the Geologic Map of Long Island by Myron L. Fuller, 1913, the area of the Penniquid Barrens is shown as Dune Sand, extending about 7 miles nearly east and west, and 2 miles north and south. These so-called Barrens lie northwest of Coram and include the villages of Selden and New Village, though the soil is better immediately about Selden than it is in some of the hollows to the north and south. There are now many abandoned farms in the region, which are gradually lapsing into forest conditions, the ground being covered with a carpet of bear-berry, an occasional juniper bush and many red cedars. Oaks are common and in many places there are stands of pitch-pine. The Dune Country has been visited three times: once in August, 1916, and twice in 1920. Mr. Davis had paid special attention to the Orthoptera, of which 34 species were found, among others *Hesperotettix brevipennis* Thomas, generally seen in clumps of sweet-fern, and *Melanoplus impudicus* Scudder, a southern species taken in the Barrens in August, 1916, and again in August and September, 1920; this *Melanoplus* was also collected near Deep Pond, Wading River, Long Island, August 7, 1912. The katydid, *Pterophylla camellifolia* Fabricius, was common; three females found August 18, 1920, were soft, having just matured. At a temperature of 50 to 54 degrees, *Pterophylla* stops singing. On September 18 a female was discovered at night laying eggs in the bark of a locust tree about one foot from the ground. Among other insects of interest was a large female *Mantispa brunnea* Say, discovered by Mr. Engelhardt; also *Lomamyia flavicornis* Walker, which likewise belongs to the Neuroptera; the *Lomamyia* was also collected at Central Park, Long Island, August 12, 1913, and May 26, 1918. The large ox-beetle, *Strategus antaeus* (Fabricius), occurs in the Penniquid Barrens; and among tiger-beetles *Cicindela rugifrons* Dejean was the most common species; no *C. modesta* Dejean nor *C. consentanea* Dejean were observed. In a moist field at Coram, south of the Barrens, four pink specimens of the fulgorid *Acanalonia bivittata* Say were collected, all in a small area, while a quarter of a mile away, in a similar situation, all that were seen were green in color.

Mr. Engelhardt exhibited some of the Lepidoptera obtained by him at the Penniquid Barrens: *Hemileuca maia* Drury, of which the larvae in colonies are very common on *Quercus nana* from May to June, the moth in October; *Schinia obscurata* Strecker and *S. spinosae* Guenée, both common in August and September on *Aster*. The following were collected with bait: *Chytonix sensilis* Grote in July; *Mamestra rubefacta* Morrison in June; *Oligia minuscula* Morrison in August; *Catocala amasea* Smith and Abbot, common in August; *Agrotis violaris* Grote and Robinson in September. *Eucalyptera bipuncta* Morrison and *Eustrotia aeria* Grote were common in June and July at light.

Meeting of April 14, 1921.—*Long Island Records.*—Mr. Schott exhibited the following beetles recently taken by him: *Donacia edentata* Schaeffer from Montauk Beach; *D. rufescens* Lacordaire from Wyandanch; *Amerizus oblongulum* Mannerheim and *Aphodius prodromus* (Brahm) from Long Beach. Mr. Engelhardt reported upon a trip to the Penniquid Barrens at Coram, Long Island, April 5 and 6, for the purpose of collecting spring Noctuidae at light. The results were fairly good on the evening of the 5th under moderately warm weather conditions. On the evening of the 6th a heavy mist rolling in from the south shore, as is usual, rendered insect life inactive. The following species were collected at light: *Eutolype rolandi* Grote; *Psaphidia thaxteriana* Grote (apparently the first Long Island record of this species); *Copipanolis cubilis* Grote; *Iodia rufago* Hubner; *Melalopha albosigna* Fitch; *Epicaptera americana* Harris; *Hydriomena sorditata* Fabricius (no other Long Island record at hand for this species). Mr. Davis showed specimens of *Tetramorium guineense* (Fabricius), introduced from the tropics and now living in the greenhouse of the Brooklyn Botanic Garden.

Scientific Programme.—Mr. C. E. Olsen gave a lecture on "The Marvelous Life of our Seabeach and how it is Reproduced in Museum Groups," illustrated with lantern slides.

J. BEQUAERT, *Recording Secretary.*

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